FINAL SUBMITTAL

VOLUME I
REPORT AND APPENDICES A-F

FEASIBILITY STUDY FOR EXPANSION OF ENERGY MONITORING AND CONTROL SYSTEM (EMCS) FORT DRUM, NEW YORK

Prepared for

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EXECUTIVE SUMMARY

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LIST OF ABBREVIATIONS

AC	-	air conditioning
ACC	-	anticipated contract cost
ACCU	-	air cooled condensing unit
ACM	-	asbestos containing material
ACU(s)	-	auxiliary control unit(s)
AHU	-	air handling unit
AI	-	analog input
AO	-	analog output
ASCII	-	American Standard Code for Information Interchange
ASHRAE	-	American Society of Heating, Refrigeration, and Air conditioning Engineers
B/C	-	benefit-to-cost ratio
BCD	-	binary coded decimal
BLDG	-	building
BEACON	-	Building Energy Simulation Program
Btu	-	British thermal units
Btuh	-	British thermal units per hour
B/W	-	black and white
C	-	Celsius
CCC	-	central communications controller
ccf	-	one hundred (100) cubic feet
CCU	-	central control unit

cf	-	cubic foot, cubic feet
cfm	-	cubic feet per minute
CLM	-	command line mnemonic
CLMI	-	command line mnemonic interpreter
COE	-	Corps of Engineers
COS	-	central operator station
CPU	-	central processing unit
CRT	-	cathode ray tube
CU(s)	-	control unit(s)
CWE	-	current working estimate
d	-	day(s)
DCP	-	duty cycle program
DEH	-	Directorate of Engineering and Housing
DHW	-	direct memory access
DI	-	digital input
DO	-	digital output
DOD	-	Department of Defense
DPW	-	Department of Public Works
DTM	-	data transmission media
DX	-	direct expansion
E/C	-	energy-to-cost ratio
ECIP	-	Energy Conservation Investment Program
ECO	-	energy conservation opportunity

EEAP	-	energy engineering analysis program
eff	-	efficiency
elec.	-	electricity
EMC	-	EMC Engineers, Inc.
EMCS	-	energy monitoring and control system
EMI	-	electromagnetic interference
ESCO	-	energy service company
EZ-DOE	-	Building Energy Simulation Program
F	-	Fahrenheit
FO	-	fiber optic(s)
ft	-	foot, feet
ft^2	-	square feet
FY	-	fiscal year
gal	-	gallon(s)
hp	-	horsepower
hr	-	hours(s)
H & V	-	heating and ventilating
HVAC	-	heating, ventilation, and air conditioning
in.	-	inch(es)
I/O	-	input/output
kBtu	-	one thousand British thermal units
kcf	-	one thousand cubic feet

klb	-	one thousand pounds
kva	-	kilovolt - ampere
kW	-	kilowatt, one thousand watts
kWh	-	kilowatt-hour, one thousand watt-hours
lb	-	pound(s)
LCCA	-	life cycle cost analysis
LCCID	-	life cycle cost in design
LED	-	light emitting diode
LPG	-	liquefied petroleum gas
MAU	-	make-up air unit
MBtu	-	one million Btu
MCR	-	master control room
MHz	-	megahertz
Mh	-	man-hours(s)
mo	-	months(s)
MW	-	megawatt, one million watts
MWh	-	megawatt-hour, one million watt-hours
MZAHU	-	Multizone air handling unit
NA	-	Not active or Not applicable
NG	-	natural gas
NOAA	-	National Oceanic and Atmospheric Administration
no.	-	number
OA	-	outside air

O&M	-	operation and maintenance
PC	-	personal computer
PM	-	preventative maintenance
PROM	-	programmable read-only memory
psi(a)(g)	-	pounds per square inch (absolute) (gage)
RAM	-	random access memory
RCU(s)	-	remote control unit(s)
RTC	-	real-time clock
RTDOS/E	-	real-time disk operating system /executive
S&A	-	Supervision and Administration
scfm	-	sea-level cubic feet per minute
SES	-	shared energy savings
SIOH	-	supervision, inspection, and overhead
SIR	-	savings-to-investment ratio
SPW	-	single present worth
sq.ft.	-	square feet
st/sp	-	start/stop
stm	-	steam
SZAHU	-	single zone air handling unit
t	-	ton
temp	-	temperature
TRY	-	test reference year

UA	-	overall heat transfer coefficient (Btu/hr/ft^2/°F)
UCU(s)	-	unitary control unit(s)
UH	-	unit heater
UMCS	-	utility monitoring and control system
UPW	-	uniform present worth
VAV	-	variable air volume
wk	-	week(s)
yr	-	year(s)

EXECUTIVE SUMMARY

OBJECTIVE

This Energy Monitoring and Control System Feasibility Study was conducted for the Norfolk District, Corps of Engineers. Its purpose was to determine the energy conservation and economic benefits of a base-wide Energy Monitoring and Control System (EMCS) to control building mechanical and electrical systems at Fort Drum.

ALTERNATIVES

A total of 115 buildings were analyzed to determine the economic benefits of EMCS monitoring and control. Three alternatives were evaluated for Fort Drum:

- Alternative 1: Expand the Trane Tracer 100 EMCS to the buildings by adding more TRANE hardware and dial-up telephone lines to these buildings, and programming the data base and control sequences. The system would include the original 16 buildings plus any new buildings which were economically justified. The disadvantage to Alternative 1 is that the Trane Trace 100 EMCS technology is becoming obsolete. Also, the expansion of this system would have to be sole-sourced, which would increase the system cost. The additional cost for sole-sourcing is not predictable; therefore, it is not included in this analysis.

- Alternative 2: Install a new EMCS in parallel with the existing Trane Tracer 100 EMCS, thus ending up with two EMCS both operating over dial-up telephone lines. This would require installing a new central workstation and new field panels to the new buildings, telephone lines in the new buildings, and programming the data base and control sequences. The disadvantage to Alternative 2 would be maintaining two EMCS.

- Alternative 3: Install a new EMCS in place of the existing Trane Tracer 100 EMCS, plus add the new buildings. The new EMCS would utilize dial-up telephone line data transmission media (DTM), and would incur the costs of installing a new central workstation and new field panels in the new buildings and in the buildings with the Trane Tracer hardware. The disadvantage to Alternative 3 is the high cost, which thereby eliminates many buildings from inclusion in the EMCS. The advantage to alternative 3 is that the system would use the latest technology. Also, there would be an advantage in maintaining a single EMCS system.

METHODOLOGY

For each of the 115 buildings, implementation costs, energy savings, and manpower cost avoidance were determined for each heating, ventilation, and air-conditioning (HVAC) system, for each energy management function. Any energy management function which had a poor simple payback was dropped from the project. The remaining implementation costs and energy savings were summarized and the buildings were ranked in order of priority according to the savings-to-investment ration (SIR) of each. A project life cycle cost analysis (LCCA) was then performed for the three alternatives.

EMCS OPERATIONS AND MAINTENANCE

It is recommended Fort Drum add two EMCS operators, more formally classified as "utility systems controllers," to operate and manage the additional buildings included in this expansion project.

Correct and continuing maintenance of EMCS equipment is essential if the maximum benefits of the system are to be realized. It is recommended that this equipment be maintained and calibrated under a maintenance contract by a manufacturer's service representative. The costs for additional system operators and a maintenance contract were included in the economic evaluation of the project.

CONCLUSIONS

- Of the 115 buildings evaluated, 110 buildings would provide an SIR greater than 1.0, if included in the EMCS, under Alternatives 2 or 3.
- The estimated construction cost for Alternative 3, to include the new buildings and upgrade the existing buildings was $3,335,539, only $521,041 more than Alternative 2.
- Including those HVAC and utility systems which have sufficient cost avoidance to justify connection to the EMCS, resulted in controlling and monitoring 4,931 points.

RECOMMENDATIONS

- It is recommended that an Energy Conservation Investment Program (ECIP) project be developed to provide a new EMCS at Fort Drum to control and monitor systems in 99 buildings without an existing control system, as evaluated in this study, plus replace the existing hardware in the 16 buildings connected to the existing Tracer system.

Alternative 3 would allow Fort Drum to have a single EMCS. The benefits of having a single EMCS are in the operation and maintenance of one EMCS, instead of two parallel EMCS. The EMCS should consist of new PC-based front-end computers communicating to building Remote Control Units (RCUs), Auxiliary Control Units (ACUs), and Unitary Control Units (UCUs), to control and monitor 4,931 points.

- It is recommended that all data transmission media be FO cable. A new data transmission system, consisting of contractor-installed aerial and underground FO cable is recommended for all data communication needs to the 99 buildings without an existing control system, recommended for the EMCS. It is also recommended that the existing FO DTM in the 99 buildings without an existing control system.

  It is recommended that Fort Drum hire two additional EMCS operators for the EMCS.

FORT DRUM SUPPORT

To be cost effective, the EMCS will need strong support from Fort Drum. If it does not get this support, large sums of money may be spent on an EMCS which never meets the Fort Drum cost savings goals. The cost effectiveness of an EMCS depends on several factors, including the following:

- Proper training and motivation of operators to use a large, expensive EMCS.

- Coordination between EMCS operations and DEH personnel, contractors, and others, to reduce both wasted materials and labor, and duplication of effort.

- Basic training of shops personnel to assure their activities do not excessively hinder EMCS operations. Education will enable shops personnel to use the EMCS in their operation and maintenance (O&M) and utilities areas and thereby improve overall cost effectiveness.

- High priority of funding for EMCS maintenance in order to keep the system in good operating condition.

- Obtaining a maintenance contract for EMCS hardware and software.

- Periodic verification and validation of energy and O&M cost savings to ensure that the EMCS is performing as planned.

If successfully implemented, the EMCS can assist all personnel in carrying out their missions. The EMCS can save energy, predict equipment failure, detect equipment failure quickly, and schedule preventive maintenance. Significant potential for cost avoidance exists at Fort Drum if EMCS

administration, operations, and maintenance activities are properly planned and implemented, and if the EMCS is used to its full capability. The existing system has proven that an EMCS will significantly lower utility costs for the Government.

TABLE ES-1
SYSTEM ECONOMICS

SYSTEM ECONOMICS	ALTERNATIVE 1 1995 $	ALTERNATIVE 2 1995 $	ALTERNATIVE 3 1995 $
Anticipated Contract Cost ($)	2,763,121	2,814,498	3,335,539
Total Investment, Per ECIP Guidance ($)	3,080,881	3,138,166	3,719,127
Annual Savings (MBtu)	182,855	182,855	182,855
First Year Energy Savings ($)	1,422,972	1,422,972	1,422,972
Annual Maintenance Manhours Savings ($)	56,820	56,820	56,820
Annual Electrical Demand Savings ($)	2,653	2,653	2,653
Annual Maintenance Cost ($)	(50,000)	(50,000)	(50,000)
Total Non-Energy Annual Recurring Savings ($)	6,820	6,820	6,820
Net First Year Savings ($)	1,429,792	1,429,272	1,429,272
Simple Payback (years)	2.15	2.19	2.60
Net Discounted Savings ($)	12,849,270	12,849,270	12,849,270
SIR	4.17	4.09	3.45

Table ES-2, starting on page ES-5, provides a summary of identical buildings which were grouped for the purpose of analysis.

Table ES-3 on page ES-6 summarizes the potential energy savings for Alternative 3. Column A of this table lists the savings for the building and systems analyzed in this feasibility study and recommended for connection to the EMCS for Alternative 3. Column B lists the energy usage incurred at Fort Drum in FY94. Column D lists the percent savings predicted for the EMCS, compared to FY94. Table ES-4 on page ES-6 provides similar information.

TABLE ES-2
SIMILAR BUILDINGS

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
1	36		Medical Center
2	1750	1240	Motor Repair Shop
3	2060	2050, 2072, 2074, 2070	Mnt Hangar Avum -Hangar Zone
4	2060		Mnt Hangar Avum -Ops Zone, 24-Hour Ops
5	2065		AF Ops building 24-Hr Ops
6	2065		AF Ops building Admin
7	4230		Mini-Mall w/ Gas
8	4305	10050	Physical Fitness Center
9	4530		SMA Building
10	10000		DIV CMD/CNTL Building
11	10205		Dental Clinic
12	10207	10502	Exchange/Club
13	10506		Clinic W/O Beds
14	10522	30, 173, 175, 4422, 4432, 4412, 4414, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Admin
15	10522	30, 173, 175, 4412, 4414, 4422, 4432, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Barrack
16	10550	30, 175, 4450, 10150, 10250, 10450, 10650	Enl Pers Din

TABLE ES-2
SIMILAR BUILDINGS

(Concluded)

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
17	10630	119, 174, 4400, 4410, 4420, 4430, 10100, 10110, 10120, 10130, 10200, 10210, 10220, 10230, 10400, 10410, 10420, 10500, 10510, 10520, 10610, 10620, 10640	Bn HQ Bldg
18	10670	4475, 4485, 4486, 10170, 10270, 10470, 10480, 10570, 10580, 10660, 10680	Veh Mnt Shop
19	10715		Post Safety/LEA 1st Floor
20	10715		Post Safety/LEA 2nd Floor
21	10730		Clo Sales/Retail/ Commissary
22	10745	4325, 4330, 10790, 10785	Child Support Center
23	10785	4405, 10030	Chapel/Rel Ed/ Child Care Cnt -RE/CC Zone
24	10785	4405, 10030	Chapel Zone
25	10785	4405, 10030	Chapel Offices Zone
26	11050		Clinic W/O Beds/ Supply/Incin- Non-Emergency
27	11050		Clinic W/O Beds/ Supply/Incin- Emergency
28	2060	2050, 2070, 2072, 2074	Mnt Hangar Avum- Ops Zone M-F 0600-1700

TABLE ES-3
ENERGY SAVINGS SUMMARY

	(A) ANNUAL SAVINGS	(B) CURRENT USAGE	(C) USAGE AFTER IMPLEMEN-TATION	(D) % SAVINGS (A)/(B)
Electricity (kWh)	15,618,500	97,210,000	81,591,500	16.07%
No. 2 Fuel Oil (MBtu)	26,627	327,432	300,805	8.13%
High Temperature Hot Water	102,697	518,556	415,859	19.80%
Totals (MBtu)	182,630	1,177,766	995,136	15.51%

TABLE ES-4
ENERGY COST SAVINGS SUMMARY

	(A) ANNUAL SAVINGS ($)	(B) ANNUAL CURRENT USAGE ($)	(C) % SAVINGS (A)/(B)
Electricity	854,331	5,317,387	16.07%
No. 2 Fuel Oil (MBtu)	113,271	1,392,896	8.13%
High Temperature Hot Water	452,894	2,286,832	19.80%
Totals	1,420,497	8,997,115	15.79%

SECTION 1.0

INTRODUCTION

1.1 AUTHORITY FOR ENERGY MONITORING AND CONTROL SYSTEM (EMCS) FEASIBILITY STUDY

This Energy Monitoring and Control System (EMCS) Feasibility Study was conducted and this report prepared under Contract No. DACA01-94-D-0033, Delivery Order 0006, issued by the Norfolk District Corps of Engineers on 28 September 1994.

1.2 PURPOSE OF ENERGY MONITORING AND CONTROL SYSTEM FEASIBILITY STUDY

The purpose of this Feasibility Study was to determine the economic feasibility of adding additional buildings to the existing Energy Monitoring and Control System at Fort Drum, New York, as outlined in the Scope of Work, below.

1.3 SCOPE OF WORK

The Scope of Work for this Feasibility Study is presented in Appendix A, which also includes a confirmation notice of instructions furnished at the entrance interview conference.

In summary, the requirements for the Feasibility Study include:

- Review data for the existing EMCS.
- Conduct a field survey of mechanical and electrical systems to be monitored and controlled by the EMCS in 130 buildings, including 16 Trane Tracer buildings.
- Evaluate selected buildings to determine which EMCS applications are feasible, based on utility and labor cost avoidance.
- Determine the feasibility of connecting buildings to the EMCS.
- Perform a life cycle cost analysis (LCCA) to reflect savings-to-investment (SIR) ratio calculations and simple payback.
- Prepare a life cycle cost in design (LCCID) summary for each recommended project developed.

- Prepare a DD Form 1391, Project Development Brochure, and supporting data.
- Illustrate the methods and justifications of the approaches taken.
- Prepare a comprehensive report.
- Indicate the work accomplished to date.
- Submit the plan of work remaining to complete the study.

1.4 APPROACH

The approach taken in performing the Feasibility Study consisted of the following:

- Performing a field survey to document the hardware and operational information of the existing heating, ventilating, and air conditioning (HVAC) systems.
- Collecting available information and data relative to historical energy usage, current utility rate schedules, building and equipment utilization, and existing energy conservation efforts.
- Reviewing existing building drawings, as available.
- Developing a preliminary point schedule which includes EMCS functions for each applicable building.
- Evaluating the energy savings available from each energy management function for each system, with the aid of computer energy simulations for typical buildings.
- Determining the cost of implementing each function for each system.
- Evaluating the implementation costs and energy savings for each of the functions per system in the buildings evaluated by extrapolating the computer energy simulation results.
- Summarizing savings and costs for selected functions and systems for each building, and ranking the buildings in order of priority of their SIR.

1.5 WORK ACCOMPLISHED

With the completion of this Final Submittal, the following items have been accomplished:

- Reviewed data for the existing EMCS.
- Conducted a site survey of the 130 buildings.
- Conducted entrance interview.
- Evaluated base energy and EMCS application functions using computer energy modeling for selected buildings.
- Determined utility and labor cost avoidance for EMCS application functions for similar buildings.
- Prepared and delivered Interim Submittal.
- Attended Interim Submittal review conference.
- Updated any calculations and/or cost estimates as related to EMCS from comments received at the Interim Submittal review conference.
- Determined EMCS basewide data transmission medium (DTM).
- Prepared DTM cost estimates.
- Prepared LCCID summary for recommended project.
- Prepared narrative summary of conclusions and recommendations.
- Prepared separately bound Executive Summary.
- Prepared draft DD1391 for recommended project.
- Provided Prefinal Submittal.
- Made final revisions and corrections.
- Presented Final Submittal.
- Conducted exit interview.

SECTION 2.0

FACILITY DATA

2.1 GENERAL

This Feasibility Study evaluates the economic benefits of adding additional buildings to the existing EMCS. These buildings include administrative buildings, barracks, maintenance shop buildings, dining facilities, retail sales stores, clubs, recreational facilities, and other service-type buildings.

2.2 BUILDINGS INCLUDED IN ANALYSIS

A total of 115 buildings were analyzed to determine the economic benefits of EMCS monitoring and control. The buildings evaluated for the EMCS are shown in Table 2-1, starting on page 2-2.

Various groups of buildings were determined to be identical in construction and usage. Table 2-2, starting on page 2-7, lists the 28 building sections analyzed and those similar buildings which were extrapolated to the building sections analyzed.

For the purpose of analysis, 20 buildings were modeled with a computer energy simulation program. Four of these buildings were broken down into two separate zones, and two buildings were broken into three separate zones. Therefore, a total of 28 building sections were simulated.

TABLE 2-1
BUILDINGS EVALUATED FOR EMCS

BLDG NO.	BUILDING USE	BUILDING AREA (ft^2)
30	BRKS & MESS HALL	23,446
36	MEDICAL CENTER	26,440
119	BN HQ & CLASSROOM	14,954
173	BARRACKS	65,700
174	CO HQ	24,161
175	BRKS & MESS HALL	85,139
176	ELECTRICAL SUBSTATION	----
1240	TOE MAINT	40,491
1750	MOTOR REPAIR SHOP	38,336
2049	WSAAF HANGAR	32,540
2050	MNT HANGER AVUM	32,724
2060	MNT HANGER AVUM	58,470
2065	AF OPS BLDG	24,466
2070	MNT HANGER AVUM	102,256
2072	MNT HANGER AVUM	45,639
2074	MNT HANGER AVUM	32,883
2168	SUBSTATION	1,815
2792	AMMO INSPECTION	7,424
4230	MINI MALL W/GAS	10,220
4305	PHYS FITNESS CENTER	32,157
4325	SKILL DEV CENTER	21,720
4330	RECREATION CNTR	12,968
4350	OPEN DIN NCO	13,310
4400	RGT HQ BUILDING	13,712

TABLE 2-1
BUILDINGS EVALUATED FOR EMCS

(Continued)

BLDG NO.	BUILDING USE	BUILDING AREA (ft^2)
4405	UNIT CHAPEL	9,420
4410	BN HQ BLDG	12,838
4412	ENL BK W/O DIN	51,280
4414	ENL BK W/O DIN	35,198
4420	BN HQ BLDG	13,007
4422	ENL BK W/O DIN	34,190
4430	BN HQ BLDG	12,451
4432	ENL BK W/O DIN	35,294
4450	ENL PERS DIN	12,730
4475	VEH MAINT SHOP	87,687
4485	VEH MAINT SHOP	37,717
4486	VEH MAINT SHOP	27,733
4525	DOL WAREHOUSE	115,000
4530	SMA BUILDING	195,670
10000	DIV CMD/CNTRL BLDG	80,294
10030	UNIT CHAPEL	9,420
10050	PHYS FIT CENTER	77,130
10100	BRIGADE HQ BLDG	11,250
10110	BN HQ BLDG	12,450
10112	ENL BK W/O DIN	49,162
10114	ENL BK W/O DIN	47,038
10120	BN HQ BLDG	12,450
10122	ENL BK W/O DIN	49,156
10124	ENL BK W/O DIN	47038
10130	BN HQ BLDG	13,305

TABLE 2-1
BUILDINGS EVALUATED FOR EMCS
(Continued)

BLDG NO.	BUILDING USE	BUILDING AREA (ft^2)
10132	ENL BK W/O DIN	50,156
10134	ENL BK W/O DIN	59,693
10150	ENL PERS DIN	18,460
10170	VEH MAINT SHOP	25,984
10200	BRIGADE HQ BLDG	11,248
10205	DENTAL CLINIC	18,546
10207	EXCHANGE/CLUB	18,199
10210	BN HQ BLDG	12,448
10212	ENL BK W/O DIN	51,794
10214	ENL BK W/O DIN	48,961
10220	BN HQ BLDG	12,448
10222	ENL BK W/O DIN	51,794
10224	ENL BK W/O DIN	48,961
10230	BN HQ BLDG	12,448
10232	ENL BK W/O DIN	51,794
10234	ENL BK W/O DIN	57,581
10250	ENL PERS DIN	18,553
10270	VEH MAINT SHOP	25,984
10400	BDE HQ BLDG	11,249
10410	BN HQ BLDG	12,450
10412	ENL BK W/O DIN	54,872
10414	ENL BK W/O DIN	59,078
10420	BN HQ BLDG	12,450
10422	ENL BK W/O DIN	47,300
10450	ENL PERS DIN	9,486

TABLE 2-1
BUILDINGS EVALUATED FOR EMCS
(Continued)

BLDG NO.	BUILDING USE	BUILDING AREA (ft^2)
10470	VEH MAINT SHOP	32,213
10480	VEH MAINT SHOP	28,057
10500	BDE HQ BLDG	11,249
10502	OPEN DIN CONSOL	18,199
10506	CLINICS W/O BEDS	18,386
10510	BN HQ BLDG	12,450
10512	ENL BK W/O DIN	52,266
10514	ENL BK W/O DIN	45,719
10520	BN HQ BLDG	12,450
10522	ENL BK W/O DIN	43,886
10524	ENL BK W/O DIN	45,746
10550	ENL PERS DIN	15,560
10570	VEH MAINT SHOP	25,827
10580	VEH MAINT SHOP	27,310
10610	BN HQ BLDG	12,452
10612	ENL BK W/O DIN	53,892
10614	ENL BK W/O DIN	44,510
10620	BN HQ BLDG	13,225
10622	ENL BK W/O DIN	52,990
10630	BN HQ BLDG	12,452
10632	ENL BK W/O DIN	51,794
10640	BN HQ BLDG	12,452
10642	ENL BK W/O DIN	43,790
10644	ENL BK W/O DIN	40,864
10650	ENL PERS DIN	12,578

TABLE 2-1
BUILDINGS EVALUATED FOR EMCS
(Concluded)

BLDG NO.	BUILDING USE	BUILDING AREA (ft^2)
10660	VEH MAINT SHOP	41,968
10670	VEH MAINT SHOP	43,519
10680	VEH MAINT SHOP	39,679
10690	ADP BUILDING	26,400
10710	FIRE STATION	5,900
10715	POST SAFETY/LEA	49,495
10730	CLO SALES STORE/EXCHANGE	76,848
10732	CLASS VI	4,000
10745	CHILD SUPPORT CENTER	23,500
10785	CHILD CARE CNTR/RELG EDUC/CHAPEL	53,480
10790	YOUTH CENTER	21,820
11050	CLINIC W/O BEDS	67,295
11130	ELEC SUBSTATION	1,550
11142	ENTOMOLOGY FAC	1,465
11144	REFUSE COLL BLDG	20,825
21510	MAIN WASH	19,247

TABLE 2-2
BUILDINGS OF SIMILAR CONSTRUCTION

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
1	36		Medical Center
2	1750	1240	Motor Repair Shop
3	2060	2050, 2072, 2074, 2070	Mnt Hangar Avum -Hangar Zone
4	2060		Mnt Hangar Avum -Ops Zone, 24-Hour Ops
5	2065		AF Ops building 24-Hour Ops
6	2065		AF Ops building Admin
7	4230		Mini-Mall w/ Gas
8	4305	10050	Physical Fitness Center
9	4530		SMA Building
10	10000		DIV CMD/CNTL Building
11	10205		Dental Clinic
12	10207	10502	Exchange/Club
13	10506		Clinic W/O Beds
14	10522	30, 173, 175, 4422, 4432, 4412, 4414, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Admin
15	10522	30, 173, 175, 4412, 4414, 4422, 4432, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Barrack
16	10550	30, 175, 4450, 10150, 10250, 10450, 10650	Enl Pers Din

TABLE 2-2
BUILDINGS OF SIMILAR CONSTRUCTION
(Concluded)

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
17	10630	119, 174, 4400, 4410, 4420, 4430, 10100, 10110, 10120, 10130, 10200, 10210, 10220, 10230, 10400, 10410, 10420, 10500, 10510, 10520, 10610, 10620, 10640	Bn HQ Bldg
18	10670	4475, 4485, 4486, 10170, 10270, 10470, 10480, 10570, 10580, 10660, 10680	Veh Mnt Shop
19	10715		Post Safety/LEA 1st Floor
20	10715		Post Safety/LEA 2nd Floor
21	10730		Clo Sales/Retail/ Commissary
22	10745	4325, 4330, 10790, 10785	Child Support Center
23	10785	4405, 10030	Chapel/Rel Ed/ Child Care Cnt -RE/CC Zone
24	10785	4405, 10030	Chapel Zone
25	10785	4405, 10030	Chapel Offices Zone
26	11050		Clinic W/O Beds/ Supply/Incin- Non-Emergency
27	11050		Clinic W/O Beds/ Supply/Incin- Emergency
28	2060	2050, 2070, 2072, 2074	Mnt Hangar Avum-Ops Zone M-F 0600-1700

2.3 ENERGY SOURCES

Electricity, No. 2 fuel oil, and liquefied petroleum gas (LPG) are sources of energy which could be conserved by the EMCS. These energy sources are discussed below.

2.3.1 Electricity

Electrical energy is supplied to Fort Drum under contract from Niagara-Mohawk Company.

2.3.1.1 Electrical Demand Charges

Niagara-Mohawk Company's electrical demand rate includes the following characteristics:

- The monthly demand is the higher of the current monthly electrical demand or the highest electrical demand which occurred in the last eleven months.
- The actual billed cost for electrical demand is based on an average of the prior 12 months' electrical demand, as described above.

The demand rate from Niagara-Mohawk Company is $6.88 per kW, per month.

2.3.1.2 Electrical Energy Charges

The electrical off-peak energy charge from Niagara-Mohawk Company is $0.0547 per kWh. The electrical on-peak energy charge is $0.652 per kWh. Niagara-Mohawk peak hours for Fort Drum are defined as the hours between 8 a.m. and 10 p.m. weekdays, with the exception of weekdays which are Government holidays. All other hours are defined as off-peak.

2.3.2 No. 2 Fuel Oil

No. 2 fuel oil is used as a source of heating at Fort Drum. The current rate for No. 2 fuel oil is $0.59 per gallon ($4.25/MBtu).

2.3.3 High Temperature Hot Water (HTHW)

High temperature hot water is used as a source of heating in the majority of the buildings at Fort Drum. The energy charge from the Jones Cogeneration Plant is $4.41 per MBtu. For FY94, there was a capacity charge that averaged a relatively constant $511,175 per month. This capacity charge was excluded from our HTHW unit cost. However, the fuel charge was included and averaged roughly $0.22 per MBtu.

2.3.4 Natural Gas

Natural gas is used as a source of heating for some of the Central Plant boilers at Fort Drum. The current rate of natural gas from Niagara-Mohawk is $0.42 per therm ($4.2 per MBtu).

2.3.5 Liquefied Petroleum Gas (LPG)

LPG is used as a source of heating at Fort Drum. The current rate for LPG is $0.58 per gallon.

2.4 ENERGY CONSUMPTION ANALYSIS

Historical energy usage data at Fort Drum was obtained for FY94 in order to compare energy savings estimates with actual consumption.

2.4.1 Electricity

Electrical energy consumption for FY94 is tabulated in Table 2-3 on the following page. The monthly electrical consumption for FY94 varied from a minimum of 6,970,000 kWh in September, to a maximum of 9,580,000 kWh in February. The total electrical billing for FY94 was $7,153,364. The monthly electrical consumption is illustrated graphically by Figure 2-1 on the following page.

TABLE 2-3
ELECTRICAL CONSUMPTION - FY94

MONTH	kWh CONSUMPTION	kW* CONSUMPTION
OCTOBER	7,440,000	12,000
NOVEMBER	7,940,000	13,000
DECEMBER	9,070,000	13,200
JANUARY	9,230,000	13,800
FEBRUARY	9,580,000	13,850
MARCH	8,640,000	13,150
APRIL	7,650,000	13,000
MAY	8,030,000	12,000
JUNE	7,400,000	11,000
JULY	8,100,000	11,200
AUGUST	7,160,000	13,000
SEPTEMBER	6,970,000	12,000
TOTAL	97,210,000	151,200

* Approximate FY91 data.

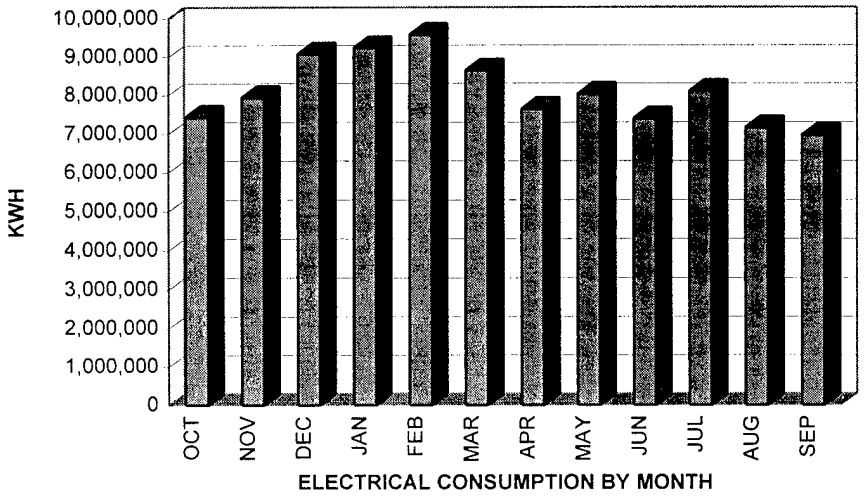

FIGURE 2-1. ELECTRICAL CONSUMPTION - FY94

2.4.2 No. 2 Fuel Oil

No. 2 fuel oil consumption for FY94 is tabulated in Table 2-4 below. The total No. 2 fuel oil consumption for FY94 was 2,402,286 gallons. The total No. 2 fuel oil billing for FY94 was $1,742,575.71. The monthly No. 2 fuel oil consumption is illustrated graphically by Figure 2-2 on the following page.

TABLE 2-4
NO. 2 FUEL OIL CONSUMPTION - FY94

MONTH	GALLONS CONSUMPTION
OCTOBER	93,049
NOVEMBER	249,104
DECEMBER	366,095
JANUARY	471,132
FEBRUARY	384,606
MARCH	363,465
APRIL	206,271
MAY	119,619
JUNE	67,138
JULY	44,193
AUGUST	19,999
SEPTEMBER	17,615
TOTAL	2,402,286

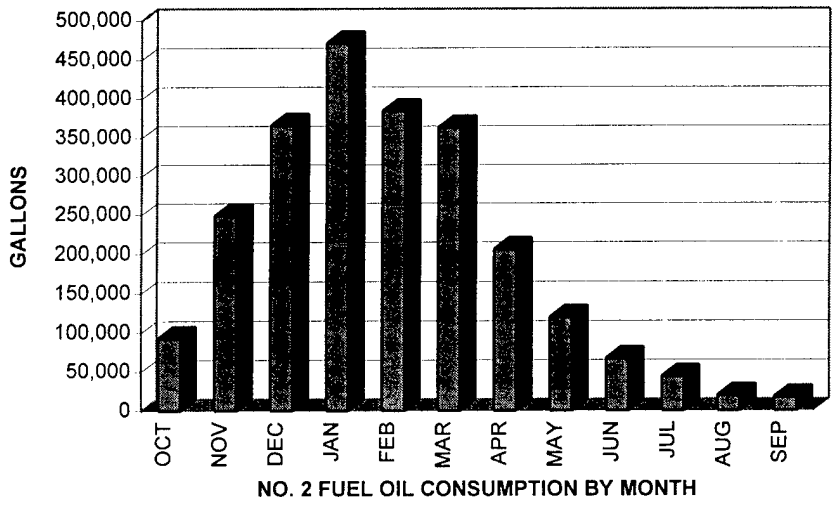

FIGURE 2-2. NO. 2 FUEL OIL CONSUMPTION - FY94

2.4.3 High Temperature Hot Water (HTHW)

High Temperature Hot Water (HTHW) consumption for FY94 is tabulated in Table 2-5 on the following page. The total HTHW consumption for FY94 was 518,556 MBtu. The total HTHW billing for FY94 was $8,473,500. The monthly HTHW consumption is illustrated graphically by Figure 2-3 on the following page.

TABLE 2-5
HTHW CONSUMPTION - FY94

MONTH	MBtu
OCTOBER	35,010
NOVEMBER	47,590
DECEMBER	66,900
JANUARY	108,950
FEBRUARY	62,438
MARCH	58,528
APRIL	43,900
MAY	30,910
JUNE	16,830
JULY	14,140
AUGUST	15,540
SEPTEMBER	17,820
TOTAL	518,556

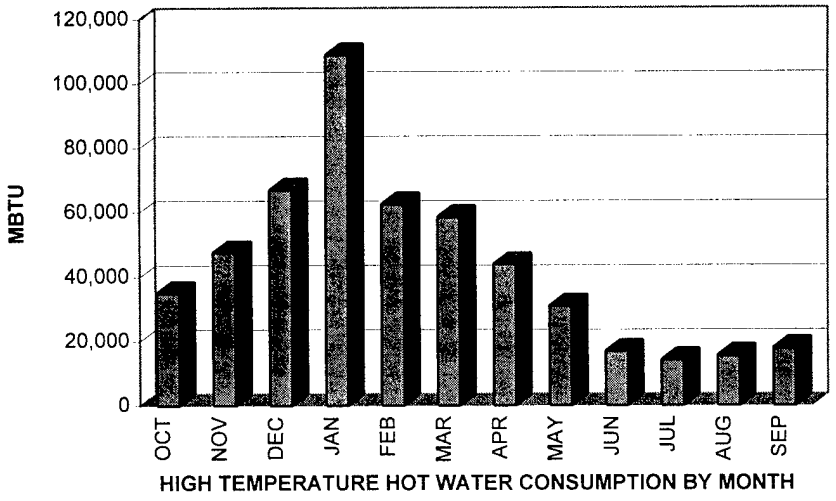

FIGURE 2-3. HTHW CONSUMPTION - FY94

2.4.4 Natural Gas

Natural gas consumption for FY93 is tabulated in Table 2-6 below. The total natural gas consumption for FY93 was 2,806,882 therms. The monthly natural gas consumption is illustrated graphically by Figure 2-4 on the following page.

TABLE 2-6
NATURAL GAS CONSUMPTION - FY93

MONTH	THERMS
OCTOBER	201,532
NOVEMBER	311,001
DECEMBER	297,515
JANUARY	396,628
FEBRUARY	488,910
MARCH	343,415
APRIL	241,463
MAY	151,253
JUNE	97,020
JULY	103,133
AUGUST	63,458
SEPTEMBER	111,554
TOTAL	2,806,882

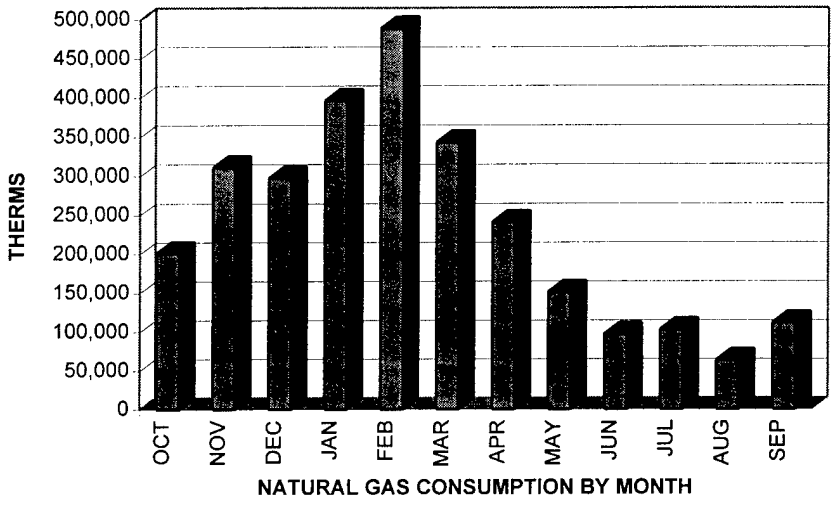

FIGURE 2-4. NATURAL GAS CONSUMPTION - FY93

2.4.5 Justification of Resource Unit Costs for Economic Analysis

The electrical cost for off-peak consumption per kWh is $0.0547 for off-peak power. Since most of the savings are during off-peak hours (night setback and scheduled start/stop), the off-peak rate excluding demand charge was used. The demand charge based on the historical data matches the charge, indicated by Mr. Steve Rowley, Fort Drum Energy Manager, to be $6.88 per kW.

The fuel oil cost for 1995, provided by Mr. Rowley, is $0.59 per gallon ($4.25/MBtu). Table 2-4 on page 2-12 is provided as a historical reference, and is based on the 1994 usage and rates.

The high temperature hot water cost for 1995, provided by Mr. Rowley, is $4.41 per MBtu. Table 2-5 on page 2-14 is provided as a historical reference, and is based on the 1994 usage and rates.

No historical data was provided for Liquefied Petroleum Gas. The unit cost for 1995, provided by Mr. Rowley, is $0.58 per gallon ($6.07/MBtu).

2.5 EXISTING CONTROLS AND EMCS

2.5.1 Existing Controls

During the field survey of the buildings evaluated for EMCS expansion, a visible inspection was conducted to determine the general condition of the local control loops. Overall, the mechanical rooms are in good condition; the HVAC system are satisfactory; and the controls are in good condition. The maintenance staff seems to be maintaining equipment and controls, including scheduled maintenance of equipment and controls. Following are examples of problems noted:

- Timeclocks are installed but the start/stop pins have been removed.
- Timeclocks are installed but not connected into the starter circuits.
- Outside air damper settings on fan systems seem to vary greatly.
- Barracks are overheating, causing GIs to open windows to control temperature.
- Insulation has been removed in several areas, such as pipes and converters, and has not been replaced.
- Occasional HTHW leaks have deteriorated insulation and corroded equipment housings.

2.5.2 Trane Tracer 100

Fort Drum has an existing Trane Tracer 100 EMCS in 16 buildings. The EMCS was designed in phases as a decentralized local building control and monitoring system. The input/output (I/O) points and functions of each building are totally independent of other buildings.

Maintenance staff interface with the system is primarily accomplished at the control room located in the maintenance building. The control room contains an IBM compatible PC, printer, and modem. On command, the PC will connect to the remote Trane Tracer 100 panels via the modem and dial-up lines. Refer to Figure 2-5, on the following page, for a description of the existing Trane Tracer 100 EMCS.

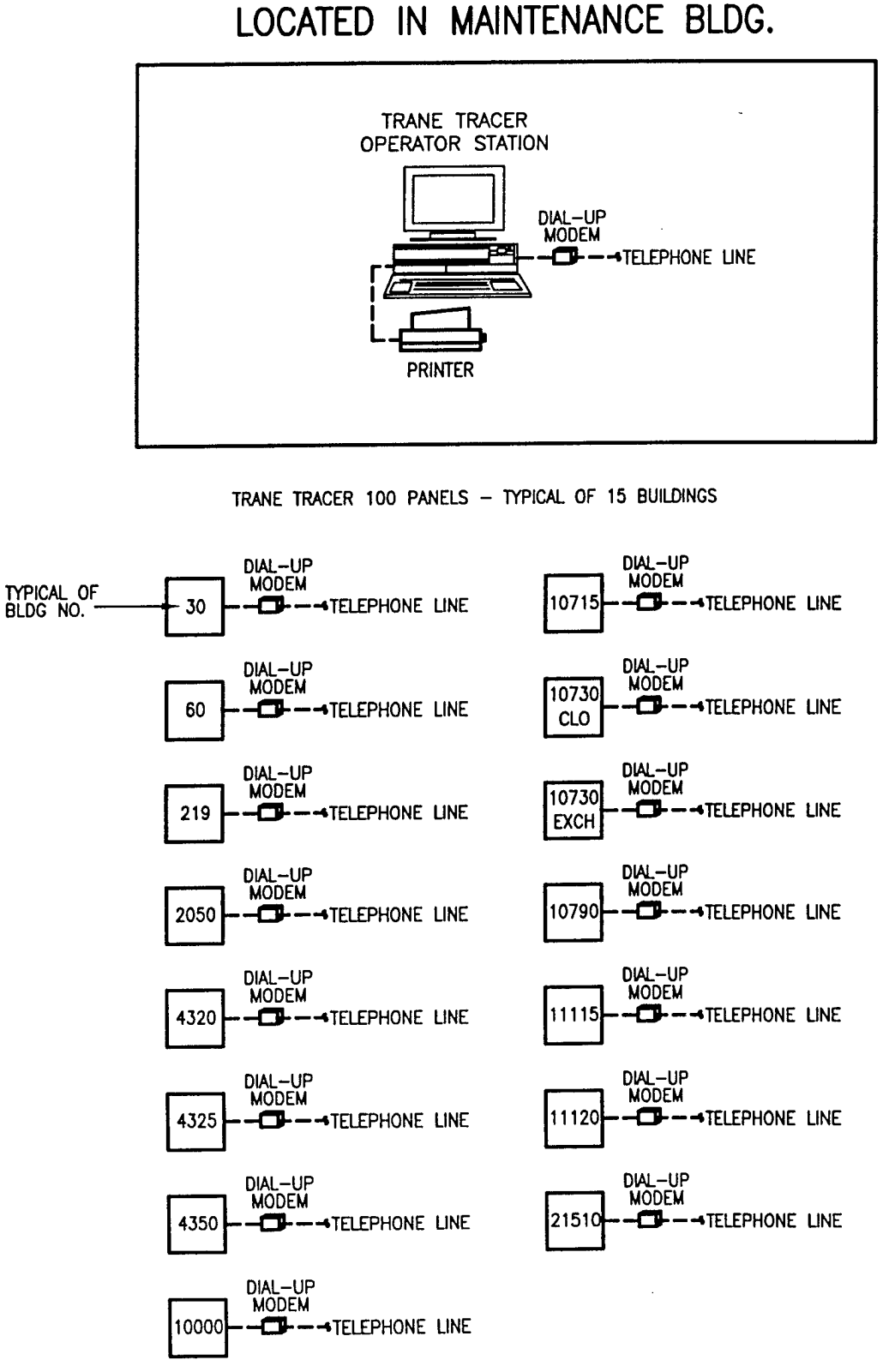

FIGURE 2–5. EXISTING TRANE TRACER 100 EMCS SYSTEM

SECTION 3.0

ENERGY MONITORING AND CONTROL SYSTEM APPLICATION

An EMCS function is a specific action performed by control software. An EMCS can be programmed to monitor and control several tasks. The name, method, and implementation approach for any particular task varies with the individual EMCS manufacturer. Variations generally depend on the particular software or hardware used by a manufacturer to accomplish each function, rather than on the task itself.

3.1 ENERGY CONSERVING EMCS FUNCTIONS

The energy conserving EMCS functions evaluated in this feasibility study include:

- Scheduled start/stop
- Optimum start/stop
- Demand limiting start/stop
- Unoccupied setback
- Ventilation/recirculation damper control
- Economizer
- Direct digital control
- Hot water outside air temperature reset
- Chilled water temperature reset.

These functions, which are described individually in Appendix B, represent the common functions applicable at Fort Drum. Not all of the EMCS functions evaluated in this study provide sufficient energy savings to justify usage in every building. These EMCS functions are described in Appendix B. The EMCS functions applicable to each system are shown in the I/O summary tables, Appendix C.2.

3.2 EMCS MONITORING FUNCTIONS

In addition to the energy conserving functions listed in Section 3.1, the EMCS can monitor the operational status and the values of operating parameters in particular areas and equipment. Data on monitored parameters may be gathered and presented to the EMCS operator in either digital or analog form. An analog monitoring point could be represented as a critical space temperature; i.e., the operator could read the actual temperature in the space at any time desired, with the EMCS programmed to signal the operator when the temperature goes outside of the programmed limits. Digital monitoring points can be characterized as an On-or-Off status indication or as an alarm signaled to the EMCS operator as the result of an alarm contact closure.

The monitoring capabilities of the EMCS will assist maintenance personnel by indicating alarm conditions, facilitating remote trouble-shooting, and generating reports to assist in scheduling equipment maintenance. This feature would be expected to be a valuable tool for maintenance personnel at Fort Drum. Theoretically, it would reduce the cost of maintenance operations by allowing more time for general service call maintenance work, and reduce casualty maintenance. It is unlikely a reduction in maintenance staff would result from this feature.

The following EMCS monitoring functions are recommended for the EMCS at Fort Drum, and the economic analysis was performed assuming their implementation. These functions are described in Appendix B:

- Run-time reports
- Temperature monitoring
- Status condition monitoring
- Energy metering.

The EMCS, either expansion or new, should be specified with a report generator having a number of standard reports, plus custom report generating capabilities. These reports provide the operators and shop personnel with valuable data for operating the EMCS, along with monitoring systems and building conditions. The standard reports specified for the EMCS, which are included on the Trane Tracer system, include:

- Status report
- Correlated alarm report
- Profile report
- Electrical power utilization report
- Energy utilization report
- Alarm report
- Lockout report
- Analog limit report
- Run-time report
- Cooling tower profile report
- Electrical peak demand prediction report
- Chiller utilization report
- Optimum start/stop report
- Out-of-service report
- Static data base report
- Real-time data base report
- DTM circuit report (Alternative 3).

SECTION 4.0

ENERGY MONITORING AND CONTROL SYSTEM REQUIREMENTS

4.1 GENERAL

Fort Drum has various alternatives for future EMCS expansion. The basic alternatives include:

- Alternative 1: Expand the Trane Tracer 100 EMCS to the buildings by adding more TRANE hardware and dial-up telephone lines to these buildings, and programming the data base and control sequences. The system would include the original 16 buildings plus any new buildings which were economically justified. See Section 2.5.2 on page 2-18 for a description of the existing Trane Tracer 100 EMCS. The disadvantage to Alternative 1 is that the Trane Trace 100 EMCS technology is becoming obsolete. Also, the expansion of this system would have to be sole-sourced, which would increase the system cost. The additional cost for sole-sourcing is not predictable; therefore, it is not included in this analysis.

- Alternative 2: Install a new EMCS in parallel with the existing Trane Tracer 100 EMCS, thus ending up with two EMCS both operating over dial-up telephone lines. This would require installing a new central workstation and new field panels to the new buildings, telephone lines in the new buildings, and programming the data base and control sequences. The disadvantage to Alternative 2 would be maintaining two EMCS.

- Alternative 3: Install a new EMCS in place of the existing Trane Tracer 100 EMCS, plus add the new buildings. The new EMCS would utilize dial-up telephone line data transmission media (DTM), and would incur the costs of installing a new central workstation and new field panels in the new buildings and in the buildings with the Trane Tracer hardware. The disadvantage to Alternative 3 is the high cost, which thereby eliminates many buildings from inclusion in the EMCS. The advantage to alternative 3 is that the system would use the latest technology. Also, there would be an advantage in maintaining a single EMCS system.

4.2 CONFIGURATIONS

The current EMCS configuration, based on the Huntsville Division Corps of Engineers current draft guide specifications, includes the following main components:

- Remote Control Units (RCU)
- Auxiliary Control Units (ACU)
- Unitary Control Units (UCU)
- Central Operator Station (COS)
- Communication Processor
- Communication Network Interface.

The EMCS, now termed "Utility Monitoring and Control System (UMCS)," is based around PC-based front-end computers, specified to be the fastest available microprocessor at the time (currently an Intel Pentium 100 MHz).

The RCU is the next level down in the system architecture. The RCU is a microprocessor-based field panel which coordinates communications and some high level control coordination with ACUs and UCUs. For a design basis, there is typically one RCU per 64 ACUs and UCUs.

The ACUs and UCUs are also micro-processor based panels, but are generally set up to control and monitor single pieces of equipment, or groups of equipment. The ACU would normally be used for large systems, and UCUs would be used for terminal devices (such as variable air volume boxes) and fan coils.

The communication processor and network interface provide the interface and management of the networks. Depending on the vendor, different networks could exist between COS, between the COS and RCUs, and between the RCUs, ACUs, and UCUs. Because the Corps of Engineers is currently changing the configurations and specifications, no further detail will be specified at this point. Where new RCUs, ACUs, and UCUs are installed, a minimum of 10% spare capacity should be provided for future use.

Any new EMCS should be a PC-based system, with RCU, ACU, and UCU system architecture.

Sensed data should be obtained from the RCUs, ACUs, and UCUs, collectively referred to as control units (CUs), which are located near the data environment monitored and controlled by the EMCS. The CUs should monitor and control all aspects of their data environments not requiring coordination with the COS. Failure procedures should be provided to automatically switch the system to manual operation in the event of a CU failure.

Hardware and configuration requirements are currently changing. If the project is funded for construction, the overall descriptions of hardware and configuration should be revised and updated as necessary to meet the most up-to-date criteria and specifications.

4.3 DATA TRANSMISSION MEDIA (DTM)

Dial-up telephone lines and modems were used for cost estimating of the communications media for building-to-work-station data transmission, for all three alternatives of the Fort Drum EMCS. Dial-up telephone lines provide low first costs and maintenance costs, and the telephone lines provide reasonable reliability.

Although more expensive than dial-up telephone lines, fiber optic (FO) data transmission systems present a unique solution to EMCS data transmission, a solution other media cannot provide as well or as reliably. FO systems will be evaluated for cost effectiveness in Alternatives 2 and 3 in the Prefinal Submittal.

In FO cables, signals are transmitted in the form of energy packets which have no electrical change. Consequently, it is physically impossible for high electric fields (lighting and high-voltage) or large magnetic fields (heavy electrical machinery, transformers, and generators) to affect the data transmission.

A number of factors favor the use of FO for EMCS and control applications:

- Elimination of ground loops and common mode voltages. This results in the following advantages:

  - Elimination of electromagnetic interference (EMI) emissions which generate "noise."

  - Immunity to electromagnetic, radio frequency, and electrical pulse interference.

  - Elimination of cross-talk.

- Safety in explosive or flammable environments.

- Capability of carrying much more information than can be carried in copper conductors.

- Fewer electrical code limitations.

- Security of information.

- Reduction in weight and size in comparison to wire cable.

- Cost effectiveness.

In addition, properly cabled optical fibers can tolerate most kinds of weather and can, without ill-effect, be exposed to polluted air or immersed in many fluids, including water. Though the FO cables themselves are not susceptible to noise, FO equipment such as transceivers and modems are susceptible to noise and should therefore be located away from EMI sources.

A basic FO transmission system consists of a transmitter, a FO cable, and a receiver. Electrical information in digital or analog form is input to the transmitter, which converts it into an optical signal and outputs via a light emitting diode (LED) or injection lasers. The information, in light form, is then transmitted over the FO cable to a receiver. The receiver typically consists of a photodetector, amplifier, and demodulator.

4.4 SENSORS AND ACTUATORS

Sensors and actuators should be provided to monitor and control all remote points of the EMCS as indicated on the I/O summary tables. The sensors should include, but not be limited to, the following:

- Temperature sensors with transmitters
- Relative humidity sensors with transmitters
- Pressure sensors
- Pressure switches
- Watt meters
- Amp meters
- Flow meters
- Current transformers
- Status relays
- Start/stop control relays
- Electric/pneumatic transducers
- Pneumatic/electric transmitters.

4.5 EMCS OPERATIONS AND MAINTENANCE

4.5.1 EMCS Operations

The Trane Tracer 100 EMCS at Fort Drum is currently operated and maintained by the Directorate of Public Works (DPW) maintenance staff. Due to the limited size of the existing system, Fort Drum does not have a dedicated EMCS operator, more formally classified as "Utility System Controller." The new EMCS will require one or two EMCS operators.

4.5.2 EMCS Maintenance

Correct and continuing maintenance of EMCS equipment is essential if the maximum benefits of the system are to be realized. Without proper maintenance, the reliability of an EMCS will rapidly deteriorate, thereby reducing its energy conservation capability and benefits. In an extreme case, the EMCS could fall into disuse as the confidence of operating personnel is lost.

Maintenance of the electronic equipment and software programs requires special technical training and experience. It is recommended that this equipment be maintained and calibrated under a maintenance contract by a manufacturer's service representative. This holds true for all the automation systems currently installed at Fort Drum. The staffing recommended in Section 4.5.1 would not be sufficient to provide both operation and maintenance of the EMCS.

4.6 AUTHORITY

The recognition and authority of the automation systems section is an important consideration. Without the full backing of top level command, the section will have difficulty in effectively implementing the energy conserving capabilities of the EMCS.

The cost effectiveness of an EMCS depends on several factors, including:

- Training and motivation of operators to properly use a sophisticated EMCS.
- Coordination between EMCS operations and maintenance personnel, contractors, and others, to reduce wasted materials, labor, and duplication of effort.
- Basic training of maintenance personnel, to assure their activities do not excessively hinder EMCS operations. Education will enable maintenance personnel to use the EMCS in operating and maintenance (O&M) and utilities areas, thereby improving the overall cost effectiveness.
- High priority of funding for EMCS maintenance, in order to keep the system in good operating condition.
- Obtaining a maintenance contract for EMCS hardware and software.
- Periodic verification and validation of energy and O&M cost savings, to ensure the EMCS is performing as planned.

If successfully implemented, the EMCS can assist all O&M personnel in carrying out their missions. The EMCS can save energy, predict equipment failure, detect equipment failure quickly, and schedule preventive maintenance. There is significant potential for cost avoidance at Fort

Drum if EMCS administration, operations, and maintenance activities are properly planned and implemented, and the EMCS is used to its full capability. The existing Trane Tracer 100 EMCS has proven that an EMCS will lower utility costs for the Government.

4.7 REPAIR OF EXISTING CONTROLS

Some EMCS functions require an interface with existing local control devices, which must be in working order for the EMCS to function properly. Local control devices consist of starters, valve actuators, and various other local control components. Prior to the EMCS installation, the maintenance of the following items should be implemented on all existing systems:

- Safety control components, such as firestats, freezestats, smoke detectors, pressure controls, and temperature controls should be in proper working order.
- Fan belt alignment and tension should be checked on all systems.
- Starters should be checked for proper fuse or breaker size, overload protection, and proper operation.
- Control valves, damper actuators, and other equipment should be in proper working order.
- Existing EMCS modems should be checked, to ensure they are in proper working order.

In cases where new control devices are required, they should be included in the final design and provided by the EMCS contractor, if funded by O&M money. The cost to repair local controls is not included in the economic analysis. The repair cost was not included because these repairs are necessary maintenance with or without the EMCS.

SECTION 5.0

ANALYSIS METHODOLOGY

5.1 PROCEDURES

The first step in conducting this feasibility study was to review the building drawings, noting the type of building construction and the location and type of mechanical equipment. A field investigation was then conducted to verify the accuracy of the drawings and to gather data on each of the mechanical systems. During this investigation, types of EMCS functions which might be applicable to each system were determined. Fort Drum personnel were queried about present methods of system operation, building occupancy schedules, and areas where EMCS control could cause potential difficulties.

An EMCS can be large and complex when applied to large buildings and multi-building facilities. Only cost-effective systems should be selected for connection to an EMCS; proper system selection will provide optimum savings.

EMC Engineers, Inc., used a series of computer programs and analysis techniques to select the buildings, systems, and functions which would provide an optimum EMCS configuration for Fort Drum. This main analysis program, written by EMC Engineers, Inc., calculates the energy savings which result when a particular EMCS function is applied to a specific mechanical system type. Savings are calculated on a function-by-function basis for each system. Typical system configurations were developed for a range of AHUs, pumps, boilers, and chillers. The calculations follow the basic guidelines described in "CR 82.030, Standardized EMCS Energy Savings Calculations, Naval Civil Engineering Laboratory."

Energy savings were calculated using energy constants derived by computer energy simulations of actual representative buildings and weather conditions at Fort Drum, using the DOE-2 computer program. The program performs hourly energy calculations and can predict the energy consumption which would result from various heating and cooling systems and operational settings. The energy savings for the buildings not simulated were extrapolated from the energy constants derived for the representative buildings. A detailed description of the algorithms used in the analysis program is located in Appendix D.

The functions provided in the analysis program include:

- Scheduled start/stop
- Optimum start/stop
- Economizer
- Direct digital control
- Unoccupied setback
- Hot water outside air reset

- Demand start/stop of motors
- Demand start/stop of chillers
- Chilled water temperature reset
- Ventilation/recirculation damper control.

The analysis computer program also developed the I/O summary table for the proposed functions for each system, estimated the cost for the hardware to implement the functions, and split the cost between function groups. Savings and costs computed by the analysis program were then entered into a spreadsheet program to calculate the economics for various functions.

The spreadsheet program has special features which allow calculations, selection of items, sorting, and prioritization of items. This system was used for the following purposes:

- To perform economic analyses on EMCS functions, systems, and buildings.
- To sort data on the benefits provided by the EMCS to obtain the optimum system.

Based on the final selection of functions, systems, and buildings, the total savings and costs will be developed into an EMCS project.

5.2 I/O SUMMARY TABLES

The Input/Output (I/O) summary tables, included in Volume I, Appendix C.2 of this report, were developed through computer analysis for each environmental system evaluated at Fort Drum. The I/O summary tables consists of:

- All applicable EMCS functions recommended for each system.
- All the sensors and actuators required to accomplish the recommended functions.

The I/O summary tables generated for the EMCS feasibility study are meant to be as accurate as possible for depicting the proposed inputs and outputs for the final design. However, because the study uses typical system types for the analysis, the final system-by-system design may vary slightly, depending on existing control configurations.

5.3 ENERGY SAVINGS

Energy savings were calculated for each EMCS function as it applied to all systems in the buildings considered in this feasibility study. Computer programs were used to simulate 20 buildings and their systems. The various EMCS functions were then simulated on the same buildings systems, and the resulting reduction in energy consumption was determined. Interrelated EMCS functions were simulated in a manner which prevented duplication of energy savings. For example, time

program savings were always calculated first, if applicable, then followed by functions such as setback, duty cycle, economizer, and reset. From the computer simulations, constants were derived and equations were developed which allowed energy savings to be calculated for similar systems in other buildings. Volume I, Appendix D, describes the energy constants and formulae used to calculate the energy savings. The backup system-by-system energy savings calculations are provided in Volume I, Appendix E.

5.4 CONSTRUCTION COSTS

The construction cost estimates are based on the final systems and functions included in the EMCS configuration and as indicated on the I/O summary tables. The unit cost for each control device, sensor, actuator, and associated wiring was estimated separately for each EMCS function. The estimated system cost includes material and labor costs, and the contractor's overhead and profit.

The EMCS feasibility study cost estimates, found in Volume I, Appendix F, Tables F-1 and F-2, contain cost estimates for field devices, wiring, and EMCS field panels.

5.5 EMCS PRIORITIZATION

Final control functions, systems, and buildings selected for this feasibility study will be based on evaluation of simple payback and SIR.

The first step in the prioritization analysis will be to combine all of the EMCS functions for a single system which use common devices within a particular system. This allows, for example, the cost of a start/stop device to be shared by both the time schedule function and the unoccupied setback function. Those EMCS functions having a very poor simple payback will be dropped from further analysis. The final step will be to determine the building SIR based on the remaining systems and functions. Included in the building costs are the remote panels (RCUs, ACUs, and UCUs) and field device point costs. In Table F-1, the buildings are sorted based on descending SIR.

5.6 EMCS ALTERNATIVES EVALUATION

To evaluate the economics of the three alternatives discussed in Section 4.0, the following factors will be incorporated.

- Alternative 1. Expansion of Trane Tracer EMCS:

  - Costs for new dial-up telephone lines included.

  - Costs for new COS added.

- Alternative 2, New EMCS Parallel Trane Tracer EMCS:

  - Cost for new dial-up telephone lines included.

  - Cost for new COS added.

- Alternative 3, Replace Trane Tracer EMCS and Expand to New Buildings:

  - Cost for new COS added.

  - Replacement of Trane Tracer field panels included.

  - Programming and testing costs included for new and replacement points added.

  - Cost for new dial-up telephone lines included.

SECTION 6.0

RESULTS OF ANALYSIS

6.1 GENERAL

This section summarizes the results of the analysis performed for all systems in each of the 115 buildings included in this feasibility study. A summary of the savings for the selected functions and a cost breakdown for the conceptual EMCS configuration are provided.

6.2 BUILDING SUMMARY

The results of the building-by-building costs and savings analysis are summarized in Table 6-1, beginning on page 6-2. The savings and costs listed in this table include only those systems and functions which are recommended for the EMCS. The CU cost was added to the point cost to determine the field hardware cost. Using these cost values and the appropriate discount factors, the ratio (SIR) was calculated for each building.

The energy savings and building construction for the system evaluated are shown in Table 6-1, page 6-1.

6.3 RESULTING CONFIGURATION

The resulting EMCS configuration (as listed in Table 6-1) contains a combined total of 4,931 new digital and analog input and output points in 115 buildings. The number of digital inputs (DI), digital outputs (DO), analog inputs (AI), and analog outputs (AO) for each building is shown in Table 6-1.

The total savings from all building analyzed in the study amounts to $1,422,972. This level of annual savings should be possible using any of the three alternative EMCS systems described in Section 4.0, page 4-1.

TABLE 6-1
BUILDING ECONOMIC SUMMARY

BLDG. NO.	BLDG. DESCRIPTION	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL EMCS POINT	$ BLDG. INST. COST	$ BLDG. PANEL COST	$ TOTAL BLDG. COST	TOTAL $ DISC. SAVING	SIR
176	ELEC SUBSTATION										1		1	100	3,650	3,750		100.0
11130	ELEC SUBSTATION										1		1	100	3,650	3,750		100.0
4530	SMA BUILDING	6	817,033	11,235			57	95,420	11	21	17	23	72	11,833	8,600	20,433	825,128	40.4
4305	PHYS FITNESS CENTER		241,752		2,007		15	22,062	4	5	7	12	28	5,065	5,450	10,515	196,528	18.7
1240	TOE MAINT		737		2,444		9	10,619	3	2	5	3	13	1,925	4,100	6,025	101,702	16.9
4475	VEH MAINT SHOP		788,324	983			42	48,295	14	25	18	30	87	14,609	9,950	24,559	410,587	16.7
10670	VEH MAINT SHOP		761,142	521			42	44,773	14	25	18	30	87	14,609	9,950	24,559	380,055	15.5
10660	VEH MAINT SHOP		761,142	505			42	44,702	14	25	18	30	87	14,609	9,950	24,559	379,433	15.4
10680	VEH MAINT SHOP		761,142	481			42	44,593	14	25	18	30	87	14,609	9,950	24,559	378,478	15.4
4485	VEH MAINT SHOP		761,142	461			42	44,506	14	25	18	30	87	14,609	9,950	24,559	377,708	15.4
10470	VEH MAINT SHOP		761,142	403			42	44,250	14	25	18	30	87	14,609	9,950	24,559	375,451	15.3
10480	VEH MAINT SHOP		761,142	359			42	44,059	14	25	18	30	87	14,609	9,950	24,559	373,765	15.2
4486	VEH MAINT SHOP		761,142	356			42	44,044	14	25	18	30	87	14,609	9,950	24,559	373,633	15.2
10580	VEH MAINT SHOP		761,142	352			42	44,025	14	25	18	30	87	14,609	9,950	24,559	373,469	15.2
10170	VEH MAINT SHOP		761,142	337			42	43,962	14	25	18	30	87	14,609	9,950	24,559	372,910	15.2
10270	VEH MAINT SHOP		761,142	337			42	43,962	14	25	18	30	87	14,609	9,950	24,559	372,910	15.2
10570	VEH MAINT SHOP		761,142	336			42	43,956	14	25	18	30	87	14,609	9,950	24,559	372,863	15.2
10050	PHYS FIT CENTER		318,367	9,077			45	58,342	26	38	26	53	143	24,695	14,000	38,695	507,824	13.1
10785	CHILD CARE CNTR		467,997	1,470			33	32,741	11	21	21	24	77	12,430	9,050	21,480	279,562	13.0
10745	CHILD SUPPORT CENTER		33,152	2,909			15	14,944	5	9	5	12	31	5,108	5,450	10,558	130,955	12.4
10790	YOUTH CENTER		32,954	2,856			15	14,695	5	9	5	12	31	5,108	5,450	10,558	128,769	12.2
4325	SKILL DEV CENTER		32,954	2,852			15	14,681	5	9	5	12	31	5,108	5,450	10,558	128,645	12.2
10205	DENTAL CLINIC	33	147,255	1,085			15	13,366	5	5	5	10	25	4,441	5,000	9,441	114,867	12.2
2070	MNT HANGER AVUM		111,928		4,778		45	27,348	14	16	25	21	76	12,240	9,050	21,290	254,660	12.0
10730	CLO SALES STORE & EXCH MAIN		393,625	1,704			42	29,886	11	31	11	24	77	12,620	9,050	21,670	255,739	11.8
1750	MOTOR REPAIR SHOP		81,570		2,290		18	14,563	6	9	7	14	36	6,093	5,900	11,993	134,379	11.2
10030	UNIT CHAPEL		154,468	760			12	12,042	3	6	5	10	24	4,251	5,000	9,251	103,149	11.2
4405	UNIT CHAPEL		154,468	760			12	12,042	3	6	5	10	24	4,251	5,000	9,251	103,149	11.2
174	CO HQ		21,020		2,115		12	10,387	4	6	4	10	24	4,236	5,000	9,236	98,155	10.6
175	BRKS & MESS HALL		95,778	2,110			24	15,025	7	13	11	15	46	7,664	6,800	14,464	130,451	9.0
10506	CLINICS W/O BEDS	15	103,080	492			12	8,154	4	4	4	7	19	3,257	4,550	7,807	69,826	8.9
10250	ENL PERS DIN		95,778	2,027			21	14,599	7	13	11	15	46	7,664	6,800	14,464	126,718	8.8
10150	ENL PERS DIN		95,778	2,020			21	14,569	7	13	11	15	46	7,664	6,800	14,464	126,454	8.7
10690	ADP BUILDING	27	115,525	1,602			39	14,349	9	13	10	15	47	7,641	6,800	14,441	123,997	8.6
11050	CLINIC W/O BEDS	16	231,210	1,445	1,743		84	28,228	23	23	23	35	104	18,499	10,850	29,349	249,749	8.5
10550	ENL PERS DIN		123,108	3,336			39	22,228	13	29	17	28	87	14,402	9,950	24,352	193,316	7.9
4350	OPEN DIN NCO		87,483	1,587			21	12,203	7	13	11	15	46	7,664	6,800	14,464	105,765	7.3
4450	ENL PERS DIN		95,778	1,469			21	12,137	7	13	11	15	46	7,664	6,800	14,464	105,031	7.3
10650	ENL PERS DIN		95,778	1,454			21	12,073	7	13	11	15	46	7,664	6,800	14,464	104,464	7.2
30	BRKS & MESS HALL		95,778	11	1,454		27	12,015	7	14	11	17	49	8,437	6,800	15,237	108,808	7.1
10450	ENL PERS DIN		97,154	1,161			21	10,854	7	13	11	15	46	7,664	6,800	14,464	93,698	6.5
2074	MNT HANGER AVUM		98,973		1,190		30	11,076	8	12	15	19	54	9,188	7,250	16,438	99,567	6.1
10110	BN HQ BLDG		45,212	1,680			24	10,361	8	12	8	19	47	8,280	6,800	15,080	90,305	6.0
2050	MNT HANGER AVUM		98,973		988		30	10,217	8	11	16	16	51	8,523	7,250	15,773	91,326	5.8
2049	WSAAF HANGAR		98,973		982		30	10,192	8	11	16	16	51	8,523	7,250	15,773	91,085	5.8
10000	DIV CMD/CNTRL BLDG	17	82,028	4,514			78	26,070	26	48	26	49	149	25,006	14,450	39,456	227,677	5.8
119	BN HQ & CLASSROOM		21,020		1,009		12	5,680	4	6	4	10	24	4,236	5,000	9,236	52,971	5.7
36	MEDICAL CENTER	54	206,680		1,827		39	20,228	12	29	18	37	96	16,331	10,400	26,731	180,182	6.7
10715	POST SAFETY/LEA	1	74,210	465			18	6,474	4	8	5	12	29	5,113	5,450	10,563	55,555	5.3
10207	EXCHANGE/CLUB	48	104,469	900	23		24	10,588	12	12	13	19	56	10,091	7,250	17,341	91,189	5.3
4400	RGT HQ BUILDING		21,020	925			12	5,469	4	6	4	10	24	4,236	5,000	9,236	47,720	5.2
2072	MNT HANGER AVUM		56,391		1,214		33	8,907	9	10	16	17	52	8,703	7,250	15,953	81,314	5.1
10130	BN HQ BLDG		21,020	897			12	5,347	4	6	4	10	24	4,236	5,000	9,236	46,648	5.1
10620	BN HQ BLDG		21,020	892			12	5,323	4	6	4	10	24	4,236	5,000	9,236	46,442	5.0
10502	OPEN DIN CONSOL	48	88,627	884	23		24	9,653	9	12	13	19	53	9,506	7,250	16,756	83,244	5.0
4420	BN HQ BLDG		21,020	877			12	5,259	4	6	4	10	24	4,236	5,000	9,236	45,871	5.0
4410	BN HQ BLDG		21,020	866			12	5,209	4	6	4	10	24	4,236	5,000	9,236	45,432	4.9

TABLE 6-1
BUILDING ECONOMIC SUMMARY
(Concluded)

BLDG. NO.	BLDG. DESCRIPTION	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL EMCS POINT	$ BLDG. INST. COST	$ BLDG. PANEL COST	$ TOTAL BLDG. COST	TOTAL $ DISC. SAVING	SIR
4330	RECREATION CNTR		48,793		188		6	3,590	2	3	3	5	13	2,315	4,100	6,415	31,315	4.9
10420	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10510	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10520	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10640	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10120	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
4430	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10410	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10610	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10630	BN HQ BLDG		21,019	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10210	BN HQ BLDG		21,020	840			12	5,093	4	6	4	10	24	4,236	5,000	9,236	44,414	4.8
10230	BN HQ BLDG		21,020	840			12	5,093	4	6	4	10	24	4,236	5,000	9,236	44,414	4.8
10220	BN HQ BLDG		21,020	840			12	5,093	4	6	4	10	24	4,236	5,000	9,236	44,414	4.8
10400	BDE HQ BLDG		21,020	759			12	4,737	4	6	4	10	24	4,236	5,000	9,236	41,278	4.5
10500	BDE HQ BLDG		21,020	759			12	4,737	4	6	4	10	24	4,236	5,000	9,236	41,278	4.5
10100	BRIGADE HQ BLDG		21,020	759			12	4,737	4	6	4	10	24	4,236	5,000	9,236	41,278	4.5
10200	BRIGADE HQ BLDG		21,020	759			12	4,737	4	6	4	10	24	4,236	5,000	9,236	41,274	4.5
4525	DOL WAREHOUSE		106,964	713			39	9,775	9	22	12	27	70	12,443	8,600	21,043	83,908	4.0
2060	MNT HANGER AVUM		12,720		993		33	5,581	7	9	14	14	44	7,523	6,350	13,873	52,088	3.8
4422	ENL BK W/O DIN			421			12	2,096		3		5	8	1,691	3,650	5,341	18,400	3.4
2065	AF OPS BLDG	119	22,303		1,315		75	9,129	20	20	24	25	89	14,529	9,950	24,479	83,783	3.4
10134	ENL BK W/O DIN + ADM & SUPPLY		27,388	760			36	5,568	9	11	9	17	46	7,580	6,800	14,380	48,339	3.4
10414	ENL BK W/O DIN + ADM & SUPPLY		27,388	752			36	5,535	9	11	9	17	46	7,580	6,800	14,380	48,052	3.3
10234	ENL BK W/O DIN + ADM & SUPPLY		27,388	733			36	5,450	9	11	9	17	46	7,580	6,800	14,380	47,306	3.3
10412	ENL BK W/O DIN + ADM & SUPPLY		27,388	699			36	5,301	9	11	9	17	46	7,580	6,800	14,380	45,992	3.2
10612	ENL BK W/O DIN + ADM & SUPPLY		27,388	686			36	5,245	9	11	9	17	46	7,580	6,800	14,380	45,495	3.2
10622	ENL BK W/O DIN + ADM & SUPPLY		27,388	676			36	5,198	9	11	9	17	46	7,580	6,800	14,380	45,083	3.1
10632	ENL BK W/O DIN + ADM & SUPPLY		27,388	667			36	5,158	9	11	9	17	46	7,580	6,800	14,380	44,734	3.1
10512	ENL BK W/O DIN + ADM & SUPPLY		27,388	666			36	5,156	9	11	9	17	46	7,580	6,800	14,380	44,710	3.1
10232	ENL BK W/O DIN + ADM & SUPPLY		27,388	660			36	5,130	9	11	9	17	46	7,580	6,800	14,380	44,485	3.1
10212	ENL BK W/O DIN + ADM & SUPPLY		27,388	660			36	5,129	9	11	9	17	46	7,580	6,800	14,380	44,477	3.1
10222	ENL BK W/O DIN + ADM & SUPPLY		27,388	660			36	5,129	9	11	9	17	46	7,580	6,800	14,380	44,477	3.1
4412	ENL BK W/O DIN + ADM & SUPPLY		27,388	654			36	5,102	9	11	9	17	46	7,580	6,800	14,380	44,236	3.1
4432	ENL BK W/O DIN			434			12	2,156		4		7	11	2,464	4,100	6,564	18,925	2.9
4230	MINI MALL W/GAS		56,390	245			18	4,526	6	8	8	17	39	7,156	6,350	13,506	38,727	2.9
10132	ENL BK W/O DIN + ADM & SUPPLY		27,388	506			36	4,450	9	11	9	17	46	7,580	6,800	14,380	38,494	2.7
10112	ENL BK W/O DIN + ADM & SUPPLY		5,337	525			21	3,026	4	10	4	13	31	5,654	5,450	11,104	26,445	2.4
10122	ENL BK W/O DIN + ADM & SUPPLY		5,337	525			21	3,026	4	10	4	13	31	5,654	5,450	11,104	26,445	2.4
10224	ENL BK W/O DIN + ADM & SUPPLY		5,337	523			21	3,018	4	10	4	13	31	5,654	5,450	11,104	26,375	2.4
10214	ENL BK W/O DIN + ADM & SUPPLY		5,337	523			21	3,018	4	10	4	13	31	5,654	5,450	11,104	26,375	2.4
10614	ENL BK W/O DIN + ADM & SUPPLY		5,337	509			21	2,957	4	10	4	13	31	5,654	5,450	11,104	25,835	2.3
10422	ENL BK W/O DIN + ADM & SUPPLY		5,337	505			21	2,940	4	10	4	13	31	5,654	5,450	11,104	25,687	2.3
10124	ENL BK W/O DIN + ADM & SUPPLY		5,337	503			21	2,930	4	10	4	13	31	5,654	5,450	11,104	25,598	2.3
10114	ENL BK W/O DIN + ADM & SUPPLY		5,337	503			21	2,930	4	10	4	13	31	5,654	5,450	11,104	25,598	2.3
10642	ENL BK W/O DIN + ADM & SUPPLY		5,337	501			21	2,922	4	10	4	13	31	5,654	5,450	11,104	25,524	2.3
10732	CLASS VI	2	19,885			91	9	1,831	3	3	4	5	15	2,535	4,550	7,085	16,084	2.3
10524	ENL BK W/O DIN + ADM & SUPPLY		5,337	489			21	2,869	4	10	4	13	31	5,654	5,450	11,104	25,062	2.3
10514	ENL BK W/O DIN + ADM & SUPPLY		5,337	489			21	2,867	4	10	4	13	31	5,654	5,450	11,104	25,039	2.3
2792	AMMO INSPECTION		1,187	292			6	1,472	1	2	1	5	9	1,761	4,100	5,861	12,914	2.2
10522	ENL BK W/O DIN + ADM & SUPPLY		5,467	502			21	2,933	5	10	5	13	33	5,943	5,900	11,843	25,623	2.2
10644	ENL BK W/O DIN + ADM & SUPPLY		5,337	438			21	2,642	4	10	4	13	31	5,654	5,450	11,104	23,057	2.1
4414	ENL BK W/O DIN + ADM & SUPPLY		5,337	378			21	2,379	4	10	4	13	31	5,654	5,450	11,104	20,745	1.9
21510	MAIN WASH					134	39	1,593		10		15	25	5,026	5,000	10,026	14,372	1.4
173	BARRACKS				44		6	308				3	3	794	3,650	4,444	2,829	0.6
10710	FIRE STATION			26			9	293		3		5	8	1,800	3,650	5,450	2,534	0.5
11142	EMTOMOLOGY FAC			3			3	75				3	3	794	3,650	4,444	644	0.1
11144	REFUSE COLL BLDG			3			3	75				3	3	794	3,650	4,444	644	0.1

6.4 ENERGY SAVINGS

Table 6-2 below summarizes the potential energy savings for the proposed EMCS. Column A of this table lists the annual energy savings for the buildings and systems analyzed in this feasibility study and recommended for connection to the EMCS. Column B lists the energy usage incurred at Fort Drum in FY94. Column C lists the percent savings predicted for the EMCS, compared to FY94.

TABLE 6-2
ENERGY SAVINGS SUMMARY

	(A) ANNUAL SAVINGS	(B) CURRENT USAGE	(C) % SAVINGS (A)/(B)
Electricity (kWh)	15,618,498	97,210,000	16%
No. 2 Fuel Oil Total Energy (MBtu)	26,626	2,402,286	11%
High Temperature Hot Water (MBtu)	102,697	518,556	20%

6.5 IMPLEMENTATION COSTS

The total anticipated contract costs (ACC) for the three alternative EMCS configurations are listed in Table 6-3, below. The anticipated contract costs include:

- 15% overhead
- 10% profit
- 2.5% bond
- 10% contingency.

TABLE 6-3
IMPLEMENTATION COSTS

	ALTERNATIVE 1 1995 $	ALTERNATIVE 2 1995 $	ALTERNATIVE 3 1995 $
Central EMCS Hardware	$ 7,500	$ 27,920	$ 27,920
EMCS Software/Database	93,000	104,200	163,100
Modems for Dial-up Phone Lines	30,000	30,000	30,000
Field Hardware (including RCUs)	1,696,902	1,696,902	1,996,902
Training	33,750	33,750	33,750
Testing	84,988	90,000	105,609
Documentation and Submittals	24,000	24,000	24,000
SUBTOTAL $	$1,970,140	$2,006,772	$2,378,281
Overhead (15%)	295,521	301,016	356,742
Profit (10%)	197,014	200,677	237,828
Bond (2.5%)	49,254	50,169	59,457
Contingency (10%)	251,193	255,863	303,231
ANTICIPATED CONTRACT COSTS	$2,763,121	$2,814,498	$3,335,539
S&A (5.5%)	$ 151,972	$ 154,797	$ 183,455
CURRENT WORKING ESTIMATE	$2,915,093	$2,969,295	$3,518,994

6.6 ECONOMIC SUMMARY

Table 6-4 below summarizes the economics of installing an EMCS as configured in this study. The total investment, per ECIP guidance, is the current working estimate plus 6% for design costs. The annual maintenance cost is based on 11% of the system hardware costs, per COE EMCS Cost Estimating Guidelines, CEHND-SP-90-244-ED-ME. It assumes the purchase of a service contract from the equipment manufacturer.

TABLE 6-4
SYSTEM ECONOMICS

SYSTEM ECONOMICS	ALTERNATIVE 1 1995 $	ALTERNATIVE 2 1995 $	ALTERNATIVE 3 1995 $
Anticipated Contract Cost ($)	2,763,121	2,814,498	3,335,539
Total Investment, Per ECIP Guidance ($)	3,080,881	3,138,166	3,719,127
Annual Savings (MBtu)	182,855	182,855	182,855
First Year Energy Savings ($)	1,422,972	1,422,972	1,422,972
Annual Maintenance Manhours Savings ($)	56,820	56,820	56,820
Annual Electrical Demand Savings ($)	2,653	2,653	2,653
Annual Maintenance Cost ($)	(50,000)	(50,000)	(50,000)
Total Non-Energy Annual Recurring Savings ($)	6,820	6,820	6,820
Net First Year Savings ($)	1,429,792	1,429,272	1,429,272
Simple Payback (years)	2.15	2.19	2.60
Net Discounted Savings ($)	12,849,270	12,849,270	12,849,270
SIR	4.17	4.09	3.45

6.7 LIFE CYCLE COST ANALYSIS

The Life Cycle Cost Analysis (LCCA) Summary on the following pages was prepared per Energy Conservation Investment Program (ECIP) Guidance, dated 4 November 1992. The uniform present worth (UPW) factors were for industrial users, 3.0% discount rate, and maximum economic life of 10 years, for Census Region 1, which includes New York.

6.8 DD-1391

Form DD 1391 is provided on the pages following the LCCA, at the end of this Section 6.

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: DRUM2
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID FY95 (92)
INSTALLATION & LOCATION: FORT DRUM, NY REGION NOS. 2 CENSUS: 1
PROJECT NO. & TITLE: DACA01-94-D-0033 EMCS PROJECT
FISCAL YEAR 1995 DISCRETE PORTION NAME: ALTERNATIVE 1
ANALYSIS DATE: 05-03-95 ECONOMIC LIFE 10 YEARS PREPARED BY: KC

1. INVESTMENT

A. CONSTRUCTION COST	$ 2763121.	
B. SIOH	$ 151972.	
C. DESIGN COST	$ 165788.	
D. TOTAL COST (1A+1B+1C)	$ 3080881.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	$ 0.	
F. PUBLIC UTILITY COMPANY REBATE	$ 0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)		$ 3080881.

2. ENERGY SAVINGS (+) / COST (-)
DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1994

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 16.00	53306.	$ 852896.	8.47	$ 7224030.
B. DIST	$ 4.41	102697.	$ 452895.	9.60	$ 4347789.
C. RESID	$ 4.25	26627.	$ 113164.	10.46	$ 1183695.
D. NAT G	$ 6.07	225.	$ 1365.	9.49	$ 12949.
E. COAL	$ .00	0.	$ 0.	8.81	$ 0.
F. PPG	$ .00	0.	$ 0.	9.30	$ 0.
M. DEMAND SAVINGS			$ 2653.	8.53	$ 22630.
N. TOTAL		182855.	$ 1422972.		$ 12791090.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ 6820.
(1) DISCOUNT FACTOR (TABLE A)	8.53	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ 58175.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) COST(-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS(+)/ COST(-) (4)
d. TOTAL	$ 0.			0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)	$ 58175.
4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3Bd1/(YRS ECONOMIC LIFE))	$ 1429792.
5. SIMPLE PAYBACK PERIOD (1G/4)	2.15 YEARS
6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C)	$ 12849270.
7. SAVINGS TO INVESTMENT RATIO (SIR)=(6 / 1G)=	4.17

(IF < 1 PROJECT DOES NOT QUALIFY)

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: DRUM2
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID FY95 (92)
INSTALLATION & LOCATION: FORT DRUM, NY REGION NOS. 2 CENSUS: 1
PROJECT NO. & TITLE: DACA01-94-D-0033 EMCS PROJECT
FISCAL YEAR 1995 DISCRETE PORTION NAME: ALTERNATIVE 2
ANALYSIS DATE: 05-03-95 ECONOMIC LIFE 10 YEARS PREPARED BY: KC

1. INVESTMENT

A. CONSTRUCTION COST	$ 2814498.		
B. SIOH	$ 154798.		
C. DESIGN COST	$ 168870.		
D. TOTAL COST (1A+1B+1C)	$ 3138166.		
E. SALVAGE VALUE OF EXISTING EQUIPMENT		$ 0.	
F. PUBLIC UTILITY COMPANY REBATE		$ 0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)			$ 3138166.

2. ENERGY SAVINGS (+) / COST (-)
DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1994

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 16.00	53306.	$ 852896.	8.47	$ 7224030.
B. DIST	$ 4.41	102697.	$ 452895.	9.60	$ 4347789.
C. RESID	$ 4.25	26627.	$ 113164.	10.46	$ 1183695.
D. NAT G	$ 6.07	225.	$ 1365.	9.49	$ 12949.
E. COAL	$ .00	0.	$ 0.	8.81	$ 0.
F. PPG	$ .00	0.	$ 0.	9.30	$ 0.
M. DEMAND SAVINGS			$ 2653.	8.53	$ 22630.
N. TOTAL		182855.	$ 1422972.		$ 12791090.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)			$ 6820.
(1) DISCOUNT FACTOR (TABLE A)		8.53	
(2) DISCOUNTED SAVING/COST (3A X 3A1)			$ 58175.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) COST(-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS(+)/ COST(-) (4)
d. TOTAL	$ 0.			0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)	$ 58175.
4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3Bd1/(YRS ECONOMIC LIFE))	$ 1429792.
5. SIMPLE PAYBACK PERIOD (1G/4)	2.19 YEARS
6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C)	$ 12849270.
7. SAVINGS TO INVESTMENT RATIO (SIR)=(6 / 1G)=	4.09

(IF < 1 PROJECT DOES NOT QUALIFY)

LIFE CYCLE COST ANALYSIS SUMMARY — STUDY: DRUM2
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP) — LCCID FY95 (92)
INSTALLATION & LOCATION: FORT DRUM, NY REGION NOS. 2 CENSUS: 1
PROJECT NO. & TITLE: DACA01-94-D-0033 EMCS PROJECT
FISCAL YEAR 1995 DISCRETE PORTION NAME: ALTERNATIVE 3
ANALYSIS DATE: 05-03-95 ECONOMIC LIFE 10 YEARS PREPARED BY: KC

1. INVESTMENT

A. CONSTRUCTION COST	$ 3335539.	
B. SIOH	$ 183455.	
C. DESIGN COST	$ 200133.	
D. TOTAL COST (1A+1B+1C)	$ 3719127.	
E. SALVAGE VALUE OF EXISTING EQUIPMENT	$ 0.	
F. PUBLIC UTILITY COMPANY REBATE	$ 0.	
G. TOTAL INVESTMENT (1D - 1E - 1F)		$ 3719127.

2. ENERGY SAVINGS (+) / COST (-)
DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1994

FUEL	UNIT COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS(3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELECT	$ 16.00	53306.	$ 852896.	8.47	$ 7224030.
B. DIST	$ 4.41	102697.	$ 452895.	9.60	$ 4347789.
C. RESID	$ 4.25	26627.	$ 113164.	10.46	$ 1183695.
D. NAT G	$ 6.07	225.	$ 1365.	9.49	$ 12949.
E. COAL	$ .00	0.	$ 0.	8.81	$ 0.
F. PPG	$ .00	0.	$ 0.	9.30	$ 0.
M. DEMAND SAVINGS			$ 2653.	8.53	$ 22630.
N. TOTAL		182855.	$ 1422972.		$ 12791090.

3. NON ENERGY SAVINGS(+) / COST(-)

A. ANNUAL RECURRING (+/-)		$ 6820.
(1) DISCOUNT FACTOR (TABLE A)	8.53	
(2) DISCOUNTED SAVING/COST (3A X 3A1)		$ 58175.

B. NON RECURRING SAVINGS(+) / COSTS(-)

ITEM	SAVINGS(+) COST(-) (1)	YR OC (2)	DISCNT FACTR (3)	DISCOUNTED SAVINGS(+)/ COST(-)(4)
d. TOTAL	$ 0.			0.

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-)(3A2+3Bd4)	$ 58175.
4. FIRST YEAR DOLLAR SAVINGS 2N3+3A+(3Bd1/(YRS ECONOMIC LIFE))	$ 1429792.
5. SIMPLE PAYBACK PERIOD (1G/4)	2.60 YEARS
6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C)	$ 12849270.
7. SAVINGS TO INVESTMENT RATIO (SIR)=(6 / 1G)= (IF < 1 PROJECT DOES NOT QUALIFY)	3.45

1. COMPONENT ARMY	FY 1997 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 13 JAN 97
3. INSTALLATION AND LOCATION Fort Drum, New York	4. PROJECT TITLE Installation of Energy Monitoring Control System (EMCS)	
5. PROGRAM ELEMENT	6. CATEGORY CODE 80000	7. PROJECT NO.	8. PROJECT COST ($000) **4,106**

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Primary Facility: Install a new EMCS to include 115 buildings. Provide PC-based front-end computers, Central Operator Station, Communication Processor and Network Interface, Remote Control Units, Auxiliary Control Units, Unitary Control Units, sensors, and actuators. Replace field hardware in 16 buildings on the existing EMCS and retain fiber optic (FO) cable to these buildings. Provide FO cable to the 99 additional buildings.	LS			3,338
Supporting Facilities: Design Cost (6%)	LS			200
Estimated Contract Cost				3,538
Contingency (10%)	LS			354
Subtotal				3,892
Supervision, Inspection and Overhead (5.5%)	LS			214
TOTAL REQUEST				4,106

10. DESCRIPTION OF PROPOSED CONSTRUCTION

The proposed construction includes a new EMCS at Fort Drum to control and monitor systems in 99 new buildings and replace field hardware in the original 16 buildings on the existing EMCS. The new EMCS should consist of PC-based front-end computers communicating to building Remote Control Units, Auxiliary Control Units, and Unitary Control Units, to control and monitor 4,931 points. A new data transmission system, consisting of contractor-installed aerial and underground FO cable shall be provided for all data communication needs to the 99 new buildings. The FO cable to the 16 buildings on the existing EMCS shall be retained and used for the replacement field hardware.

DD FORM 1391 PREVIOUS EDITIONS MAY BE USED INTERNALLY
1 DEC 76 UNTIL EXHAUSTED PAGE NO. 1

FOR OFFICIAL USE ONLY
(WHEN DATA IS ENTERED)

1. COMPONENT ARMY	FY 1997 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 13 JAN 97
3. INSTALLATION AND LOCATION Fort Drum, New York		
4. PROJECT TITLE Installation of Energy Monitoring Control System (EMCS)		5. PROJECT NUMBER

11. REQUIREMENT

PROJECT:

Install a new EMCS to include 115 additional buildings. Provide PC-based front-end computers, Central Operator Station, Communication Processor and Network Interface, Remote Control Units, Auxiliary Control Units, Unitary Control Units, sensors, and actuators. Replace field hardware in 165 buildings on the existing EMCS and retain fiber optic (FO) cable to these buildings. Provide FO cable to the 99 additional buildings. Provide two additional EMCS operators for the EMCS.

REQUIREMENT:

This project is required to reduce the fuel oil consumption, LPG consumption, electrical consumption, and electrical demand of HVAC equipment, boilers, chillers, and electric domestic hot water heaters through EMCS control technology.

CURRENT SITUATION:

Fort Drum has an existing EMCS in 16 buildings. The final construction and acceptance of this EMCS was completed in the summer of 1991. The EMCS configuration includes dual Digital Equipment Corporation (DEC) MicroVax 3100 minicomputers, three DEC VaxStation 3100's with 19" color monitors, plus peripherals and a failover controller. Six FO data transmission cables facilitate the communications from the master control room to the buildings.

Discussions with the EMCS operators at Fort Drum regarding the existing EMCS indicated the system was operational and was providing them significant utility savings (especially through electrical demand limiting). The discussions also revealed some problems and defects associated with the existing EMCS.

1. COMPONENT ARMY	FY 1997 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 13 JAN 97
3. INSTALLATION AND LOCATION Fort Drum, New York		
4. PROJECT TITLE Installation of Energy Monitoring Control System (EMCS)		5. PROJECT NUMBER

IMPACT IF NOT PROVIDED:

If this project is not funded, a reduction of 195,777 MBtu/yr cannot be achieved. Excessive amounts of fuel oil, LPG, natural gas and electricity will continue to be used, and there will be no contribution to energy reduction goals established for U.S. Army facilities by Army Headquarters.

ADDITIONAL:

This project complies with the scope and design criteria of the "Energy Conservation Investment Program (ECIP) Guidance". The project has a Savings to Investment Ratio (SIR) of 3.5 and a simple payback of 2.6 years. The implementation of this project will provide an annual energy savings of 195,777 MBtu and an annual total dollar savings of $1,037,666.

Project validation will be through the use of electric and gas meters on the existing utilities to record consumption basewide.

TRI-SERVICE MILITARY CONSTRUCTION PROGRAM (MCP) INDEXES
FOR FY 94 THROUGH FY 99 PROGRAM

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1988	1553	1556	1559	1562	1567	1572	1573	1583	1583	1594	1599	1604
1989	1610	1613	1616	1620	1627	1634	1640	1646	1652	1659	1665	1671
1990	1676	1680	1683	1686	1693	1700	1707	1714	1720	1727	1731	1736
1991	1740	1743	1745	1748	1753	1759	1764	1770	1775	1781	1785	1788
1992	1792	1794	1796	1798	1803	1807	1812	1816	1821	1825	1829	1832
1993	1836	1833	1841	1843	1847	1852	1856	1860	1865	1869	1873	1876
1994	1880	1882	1884	1886	1890	1895	1399	1903	1906	1912	1916	1919
1995	1923	1925	1927	1929	1934	1939	1943	1947	1952	1956	1960	1963
1996	1967	1969	1971	1973	1977	1982	1986	1990	1995	1999	2003	2006
1997	2010	2012	2014	2016	2021	2025	2030	2034	2039	2043	2047	2050
1998	2054	2056	2059	2061	2065	2070	2074	2079	2033	2033	2092	2095
1999	2091	2101	2104	2106	2111	2115	2120	2125	2129	2134	2130	2142

1. Use 2.2% per fiscal year for projection beyond PY 1999.

2. Tri-Service MCP Index Base = 1000 = 1 Oct 79

3. Monthly indexes derived by CEMRD-ED-CV from quarterly indexes in Table IV, CEMP-EC, 11 MAR 93.

		MCP Index
Submittal Date	May 95	1934
Bid Opening Date	Aug 98	2079
Contract Award Date	Sep 98	2083
Midpoint: of Construction	Sep 99	2129

Cost Growth Factor = 2129/1934 = 1.100827

CEMRD-ED-CV
March 1993

SECTION 7.0

CONCLUSIONS AND RECOMMENDATIONS

7.1 CONCLUSIONS

- Of the 115 buildings evaluated, 110 buildings would provide an SIR greater than 1.0, if included in the EMCS, under Alternatives 2 or 3.

- The estimated construction cost for Alternative 3, to include the new buildings and upgrade the existing buildings was $3,335,539, only $521,041 more than Alternative 2.

- Including those HVAC and utility systems which have sufficient cost avoidance to justify connection to the EMCS, resulted in controlling and monitoring 4,931 points.

7.2 RECOMMENDATIONS

- It is recommended that an Energy Conservation Investment Program (ECIP) project be developed to provide a new EMCS at Fort Drum to control and monitor systems in 99 buildings without an existing control system, as evaluated in this study, plus replace the existing hardware in the 16 buildings connected to the existing Tracer system. Alternative 3 would allow Fort Drum to have a single EMCS. The benefits of having a single EMCS are in the operation and maintenance of one EMCS, instead of two parallel EMCS. The EMCS should consist of new PC-based front-end computers communicating to building Remote Control Units (RCUs), Auxiliary Control Units (ACUs), and Unitary Control Units (UCUs), to control and monitor 4,931 points.

- It is recommended that all data transmission media be FO cable. A new data transmission system, consisting of contractor-installed aerial and underground FO cable is recommended for all data communication needs to the 99 buildings without an existing control system, recommended for the EMCS. It is also recommended that the existing FO DTM in the 99 buildings without an existing control system.

  It is recommended that Fort Drum hire two additional EMCS operators for the EMCS.

APPENDIX A

SCOPE OF WORK AND CONTRACT DOCUMENTS

GENERAL SCOPE OF WORK

FOR

FEASIBILITY STUDY FOR EXPANSION OF

ENERGY MONITORING AND CONTROL SYSTEM (EMCS)

FORT DRUM, NEW YORK

SCOPE OF WORK
FEASIBILITY STUDY
FOR
EMCS EXPANSION, FORT DRUM, NEW YORK

TABLE OF CONTENTS

ANNEXES

1.0 BRIEF DESCRIPTION OF WORK: The Architect-Engineer (AE) shall:

1.1 Review for general information the available design, construction, and operating data for the existing Energy Monitoring and Control System (EMCS).

1.2 Perform a limited site survey of selected buildings or facilities to verify construction features, electrical and mechanical equipment, occupancy, and mode of operation for energy analysis.

1.3 Evaluate EMCS applications programs (software) for specific buildings or facilities to determine their energy savings potential and economic feasibility for connection of the buildings/facilities to an EMCS.

1.4 Provide complete programming or implementation documentation for all recommended projects.

1.5 Prepare a comprehensive report to document the work performed, the results, and the recommendations.

2.0 GENERAL:

2.1 The existing EMCS was provided by TRANE. The system uses dial-up telephone communications for data transmission between buildings and the central PC computer. This study is intended to evaluate selected buildings and facilities for connection to an EMCS.

2.2 The information and analysis outlined herein are considered to be minimum essentials for adequate performance of this study.

2.3 For the purposes of this scope of work, an Energy Conservation Opportunity (ECO) is defined as the application of one or more EMCS energy conservation programs (applications software) within a particular building or facility. A project is defined as the connection of one or more buildings/facilities to the EMCS.

2.4 The AE shall ensure that all ECOs which will reduce the energy consumption or cost of operation of the installation have been considered and documented. A list of EMCS applications programs (software) to be used when evaluating specific buildings or facilities is included in TM5-815-2, "Energy Monitoring and Control Systems (EMCS)." Some of the applications programs listed in TM5-815-2 may not be applicable to the specific building or facility being evaluated; in such cases, a statement to that effect is all that is required.

2.5 The study shall include the energy consuming buildings or facilities listed in the Detailed Scope of Work, Annex A. Field work and calculations may be reduced somewhat by building repetition.

2.6 Computer modeling will be used to determine the energy savings of ECOs for typical buildings. The results of these calculations may be applied to buildings which are similar to the typical buildings. To be considered similar, a building must be essentially the same as the typical building in size, floor plan, mechanical equipment, type of construction, and occupancy. If a building is identical to a typical building in all respects except that the occupancy has been changed (e.g., a barracks converted into offices), the building should not be considered similar. In some cases, differences in physical orientation will not be a significant factor. Modeling will be done using a professionally recognized and proven computer program or programs that integrate architectural features with air-conditioning, heating, lighting, and other energy-producing or consuming systems. These programs will be capable of simulating the features, systems, and thermal loads of the building under study. The program will use established weather data files and may perform calculations on a true hour-by-hour basis or may condense the weather files and the number of calculations into several "typical" days per month. The Detailed Scope of work, Annex A, lists programs that are acceptable to the Contracting Officer. If the AE desires to use a different program, it must be submitted for approval with a sample run, an explanation of all input and output data, and a summary of program methodology and energy evaluation capabilities. The AE may use spread-sheet or manual calculations based on the standardized energy savings calculations presented in CR82-030 of Naval Facilities Engineering Command document number UG-0010, "User Guide for Single Building Controllers."

2.7 Cost estimates for all EMCS hardware, software, data transmission media (DTM), testing, and other required EMCS services shall be made using CEHND-SP-90-244-ED-ME, "Energy Monitoring and Control Systems, Large and Medium Configurations, Cost Estimating Guidelines." Quotations from the manufacturer of the existing system will be acceptable.

2.8 The most recent "Energy Conservation Investment Program (ECIP) Guidance" establishes criteria for ECIP projects and shall be used for performing the economic analyses of all ECOs and projects. Construction cost escalation for DD Form 1391 submission shall be calculated using the guidelines contained in AR 415-17 and the latest Tri-Service MCP index. The Tri-Service MCP index, when updated, is contained in the latest applicable edition of the Engineer Improvement Recommendation System (EIRS) Bulletin.

2.9 Energy conservation opportunities determine to be technically and economically feasible shall be developed into projects acceptable to installation personnel. This may involve combining similar buildings/projects into larger packages which will qualify for ECIP or MCA funding, and determining, in coordination with installation personnel, the appropriate packaging and implementation approach for all feasible ECOs.

2.10 Projects which qualify for ECIP funding shall be identified, separately listed, and prioritized by the Savings-to-Investment Ratios (SIR).

2.11 All feasible non-ECIP projects shall be ranked in order of highest to lowest SIR.

3.0 PROJECT MANAGEMENT:

3.1 Project Managers The AE shall designate a project manager to serve as a point of contact and liaison for work required under this contract. Upon award of this contract, the individual shall be immediately designated in writing. The AE's designated project manager shall be approved by the Contracting Officer prior to commencement of work. This designated individual shall be responsible for coordination of work required under this contract. The Contracting Officer will designate a project manager to serve as the Government's point of contact and liaison for all work under this contract. This individual will be the Government's representative.

3.2 Installation Assistance The Commanding Officer at each point of installation will designate an individual who will serve as the point of contact for obtaining information and assisting in establishing contacts with the proper individuals and organizations as necessary to accomplish the work required under this contract.

3.3 Public Disclosures The AE shall make no public announcements or disclosures relative to information contained or developed in this contract, except as authorized by the Contracting Officer.

3.4 Meetings Meetings will be scheduled whenever requested by the AE or the Contracting Officer for the resolution of questions or problems encountered in the performance of work. The AE and/or the designated representative(s) shall be required to attend and participate in all meetings pertinent to the work required under this contract, as directed by the Contracting Officer. These meetings, if necessary, are in addition to the presentation and review conferences. The AE's contract will be modified to include labor and costs to attend additionally scheduled meetings.

3.5 Site Visits, Inspections, and Investigations The AE shall visit and inspect/investigate the site of the project as necessary and required during the preparation and accomplishment of the work.

3.6 Records

3.6.1 The AE shall provide a record of all significant conferences, meetings, discussions, verbal directions, telephone conversations, etc., with Government representative(s) relative to this contract in which the AE and/ or designated representative(s) thereof participated. These records shall be dated and shall identify the contract number, and modification number if applicable, participating personnel, subject discussed, and conclusions reached. The AE shall forward to the Contracting Officer within ten calendar days, a reproducible copy of the records.

3.6.2 The AE shall provide a record of requests for and/or receipt of Government-furnished material, data, documents, information, etc., which if not furnished in a timely manner, would significantly impair the normal progression of the work under this contract. The records shall be dated and shall identify the contract number and modification number, if applicable. The AE shall forward to the Contracting Officer, within ten

calendar days, a reproducible copy of the record of request or receipt of material.

3.7 Interviews The AE and the Government's representative shall conduct entry and exit interviews with the Director of Engineering and Housing before starting work at the installation and after completion of the field work. The Government's representative shall schedule the interviews at least one week in advance.

3.7.1 Entry The entry interview shall thoroughly describe the intended procedures for the survey and shall be conducted prior to commencing work at the facility. As a minimum, the interview shall cover the following points:

A. Schedules.

B. Names of energy analysts who will be conducting the site survey.

C. Proposed working hours.

D. Support requirements from the Director of Engineering and Housing.

3.7.2 Exit The exit interview shall include a thorough briefing describing the items surveyed and probably areas of energy conservation. The interview shall also solicit input and advice from the Director of Engineering and Housing.

4.0 SERVICES AND MATERIALS: All services, materials (except those specifically enumerated to be furnished by the Government), labor, superintendence and travel necessary to perform the work and render the data required under this contract are included in the lump sum price of the contract.

5.0 PROJECT DOCUMENTATION: All energy conservation opportunities or projects which the AE has considered shall be included in one of the following categories and reported in the report as such.

5.1 ECIP Projects To qualify as an ECIP project, the ECO or project must have a construction cost estimate greater than $300,000, a SIR greater than one, and a simple payback period of less than eight years. The AE shall check with the installation for guidance. The overall project and each discrete part of the project shall have a SIR greater than one. For all projects meeting the above criteria, complete programming documentation will be required. Programming documentation shall consist of a DD Form 1391, life cycle cost analysis (LCCA) summary sheet(s) (with necessary backup data to verify the numbers presented), and a project development brochure (PDB). A LCCA summary sheet shall be developed for each ECO and for the overall project when more than one building are combined.

5.2 Non-ECIP Projects Projects which normally do not meet ECIP criteria, but which have an overall SIR greater than one shall be documented. The LCCA summary sheet shall be completed for all ECOs or projects. Each shall be analyzed to determine if it is feasible even if it does not meet ECIP criteria. These ECOs or projects may not meet the nonenergy qualification test. For ECOs or projects which meet this criteria,

the LCCA summary sheet, completely filled out, with all the necessary backup data to verify the numbers presented, a complete description of the project, and the simple payback period shall be included in the report. Additionally, these projects shall have the necessary documentation prepared, in accordance with the requirements of the Government's representative, for one of the following categories:

A. Quick Return on Investment Program (QRIP): This program is for projects which have a total cost not over $100,000 and a simple payback period of two years or less.

B. OSD Productivity Investment Funding (OSD PIF): This program is for projects which have a total cost of more than $100,000 and a simple payback period of four years or less.

C. Productivity Enhancing Capital Investment Program (PECIP): This program is for projects which have a total cost of more than $3,000 and a simple payback period of four years or less.

The above programs are all described in detail in AR 5-4, Change No. 1.

D. Regular Military Construction Army (MCA) Program: This program is for projects which have a total cost greater than $300,000 and a simple payback period of eight to twenty-five years.

E. Low Cost/No Cost Projects: These are projects which the Director of Engineering and Housing can perform using his resources.

5.3 Nonfeasible ECOs All buildings/facilities which the AE has considered but which are not feasible for connection to the existing EMCS shall be documented in the report, with reasons and justifications showing why they were rejected.

6.0 DETAILED SCOPE OF WORK: The detailed Scope of Work is contained in Annex A.

7.0 WORK TO BE ACCOMPLISHED:

7.1 Review Data for Existing EMCS The AE shall review for general information the construction drawings and specifications and the manufacturer's drawings and operations and maintenance manuals for the existing EMCS. This review should acquaint the AE with the details of the hardware and software used in the existing system. Much of the information the AE may need to perform his evaluations will be contained in this data.

7.2 Perform a Limited Site Survey The AE shall determine, based on information provided by the installation, which buildings are "typical" and which are "similar," as defined in paragraph 2.5. A limited field survey of all buildings listed in the Detailed Scope of Work shall be conducted to verify and/or adjust the list of "typical" and "similar" buildings. A detailed field investigation will then be made of all "typical"

buildings using the outline provided in the Detailed Scope of Work. This will include noting and reporting on malfunctioning or inoperative equipment or controls. The AE shall document his site survey on forms developed for the survey, or on the standard forms of HNDSP84-ED-ME, "Preliminary Survey and Feasibility Study for Energy Monitoring and Control Systems," and submit these completed forms as part of the report. Testing is not required.

7.3 Evaluate Selected Buildings For each building/facility listed in Annex A, the AE shall determine which applications programs are feasible for that building. He shall then determine the feasibility of connecting each building (group of buildings) to the existing EMCS. These ECOs and projects shall be analyzed in detail to determine feasibility. SIRs shall be determined using current ECIP guidance. The AE shall provide all data and calculations needed to support these analyses. All assumptions shall be clearly stated. Calculations shall be prepared showing how all numbers in the ECO were figured. Calculations shall be an orderly, step-by-step progression from the first assumption to the final number. Descriptions of the products, manufacturers' catalog cuts, pertinent drawings or sketches, and input/output (I/) summary sheets shall also be included. A LCCA summary sheet shall be prepared for each ECO or project, and shall be included as part of the supporting data. Provide a LCCID summary for each recommended project developed.

7.4 Provide Programming or Implementation Documentation For projects developed during this study, complete programming or implementation documentation shall be prepared by the AE.

7.4.1 Programming Documentation for projects which meet ECIP criteria and which the installation wants to submit as an ECIP project, complete programming documentation shall be prepared. Complete programming documentation consists of DD For, 1391, Project Development Brochure (PDB), and supporting data. These forms shall be separate from the narrative report. They shall be bound similarly to the final report in a manner which will facilitate repeated disassembly and reassembly. One 1391 and one PDB shall be furnished for this study.

7.4.1.1 Military Construction Project Data (DD Form 1391) These documents shall be prepared in accordance with AR 415-15 and the supplemental requirements in Annex B. A complete DD Form 1391 shall be prepared for each project. The form shall include a statement that the project results from an EEAP study. Documents shall be complete as required for submission to higher DA headquarters. These programming documents will require review and signatures by the proper installation personnel. All documents shall be completed except for the required signatures.

7.4.1.2 Project Development Brochure (PDB) Preparation of the PDB requires the AE to delineate the functional requirements of the project as related to the specific site. The AE shall prepare PDBs in accordance with AR 415-20 and TM5-800-3. Most projects will not require all the forms and checklists included in the Technical Manual (TM). Only that information needed for the project shall be included. The PDB-I format described in the TM shall be used for whatever information is needed.

7.4.2 Implementation Documentation For feasible projects or ECOs which do not meet ECIP criteria, implementation documentation shall be prepared. Each feasible project or ECO shall be individually packaged, fully documented, and included as s separate section in the volume containing the programming documentation. Each project or ECO shall have a complete description of work to be done, economic justifications, sketches, I/O summary sheets, and other backup data included as a section of the report. The documentation required will be as determined by the Government's representative. Documentation required will be in the categories listed in paragraph 5.2. For the QRIP, OSD PIF, and PECIP projects, documentation shall be prepared in accordance with the requirements of AR 5-4, change No. 1. A sample implementation document, consisting of a DA Form 5108-R, sketches and manufacturers' data, and a LCCA summary sheet shall be submitted for review and approval. This sample shall be submitted with the interim submittal; and it shall be approved before any other implementation documents are prepared. To the degree possible, the project selected for the sample submission shall be typical of the majority of subsequent projects to be submitted. The sample shall consist of complete implementation documents, with primary emphasis on format and manner of presentation, rather than precise accuracy of cost estimates and energy savings data. For MCA projects, the documentation required shall be in accordance with paragraph 7.4.1. For low cost/no cost projects which the Director of engineering and Housing personnel can perform, the following information shall be provided:

A. Brief description of the project.

B. Brief description of the reasons for the modification.

C. Specific instructions for performing the modification.

D. Estimated dollar and energy savings per year.

E. Estimated manhours and labor and materials costs. Costs shall be calculated for the current year and so marked. Manhours shall be listed by trade.

Separate sheets for each project, showing the above information, shall be prepared and included in the report.

7.5 Submittals, Presentations, and Reviews The work accomplished shall be fully documented by a comprehensive report. The report shall have a table of contents and be indexed. Tabs and dividers shall clearly and distinctly divide sections, subsections, and appendices. All pages shall be numbered. The AE shall give a formal presentation of all but the final submittal to installation, command, and other Government personnel. The AE shall prepare slides or view graphs showing the results of the study to date for his presentation. During the presentation, the personnel in attendance shall be given ample opportunity to ask questions and discuss any changes deemed necessary to the study. A review conference will be conducted the same day, following the presentation. Each comment presented at the review conference will be discussed and resolved, or action items assigned. The AE shall provide the comments from all reviewers and written notification of the action taken

on each comment, to all reviewing agencies, within three weeks after the review meeting. It is anticipated that each presentation and review conference will require approximately one working day. The presentation and review conferences will be at the installation of the date(s) agreeable to the Director of Engineering and Housing, the AE, and the Government's representative. The Contracting Officer may require a resubmittal of any document(s), if such document(s) are not approved because they are determined by the Contracting Officer to be inadequate for the intended purpose.

7.5.1 Interim Submittal An interim report shall be submitted for review after the field survey has been completed and an analysis has been performed on all of the ECOs. The report shall indicate the work which has been accomplished to date, illustrate the methods and justifications of the approaches taken, and contain a plan of the work remaining to complete the study. I/O summary sheets, and calculations showing energy and dollar savings and SIRs of all ECOs/projects, shall be included. The simple payback period of all ECOs/projects shall be calculated and shown in the report. The AE shall submit the Scope of Work andy any modifications to the Scope of Work as an appendix to the report. a narrative summary describing the work and results to date shall be a part of this submittal. During the review period, the Government's representative shall coordinate with the Director of Engineering and Housing and provide the AE with direction for packaging or combining ECOs for programming purposes and also indicate the fiscal year for which the programming or implementation documentation shall be prepared. The survey forms completed during this audit shall be submitted with this report. The survey forms only may be submitted in final form with this submittal. They should be clearly marked at the time of submission that they are to be retained. They shall be bound in a standard three-ring binder which will allow repeated disassembly and reassembly of the material contained within.

7.5.2 Prefinal Submittal The AE shall prepare and submit the prefinal report when all sections of the report are complete. The AE shall submit the Scope of Work as an appendix to the submittal. The report shall contain a narrative summary of conclusions and recommendations, including a summary of findings on malfunctioning or inoperative equipment for each building proposed for connection to the existing EMCS, together with all raw and supporting data, methods used, and sources of information. The report shall integrate all aspects of the study. The report shall list the recommended projects in order of descending SIR. The synergistic effects of all of the applications programs proposed for any particular building shall have been determined and the results of the original calculations adjusted accordingly. Completed programming and implementation documents for the recommended projects shall be included. The programming and implementation documents shall be ready for review and signature by the installation commander. The prefinal report, separately bound Executive Summary, and all appendices shall be bound in standard three-ring binders which will allow repeated disassembly and reassembly. The prefinal submittal shall be arranged to include the following:

A. A separately bound Executive Summary, to give a brief overview of what was accomplished and the results of this study, using graphs, tables, and charts as much as possible.

B. The narrative report, containing a copy of the Executive Summary at the beginning of the volume, and describing in detail what was accomplished and the results of this study.

C. Appendices, to include the detailed calculations and all backup material.

D. The programming and implementation documentation.

A list of all projects and ECOs developed during this study shall be included in the Executive Summary, and shall include the following data from the LCCA summary sheet: The cost (construction plus SIOH); the annual energy savings (type and amount); the annual dollar savings; the SIR; the simple payback period; and the analysis date. For all programmed projects, also include the year in which it is programmed and the programmed year cost.

7.5.3 Final Submittal Any revisions or corrections resulting from comments made during the review of the prefinal report or during the presentation and review conference shall be incorporated into the final report. These revisions or corrections may be in the form of replacement pages, which may be inserted in the prefinal report, or complete new volumes. Pen and ink changes or errata sheets will not be acceptable. If replacement pages are to be issued, it shall be clearly stated with the prefinal submittal that the submitted documents will be changed only to comply with the comments made during the prefinal conference, and that the volumes issued at the time of the prefinal submittal should be retained. Failure to do so will require resubmission of complete volumes. If new volumes are submitted, they shall be in standard three-ring binders and shall contain all the information presented in the prefinal report, with any necessary changes made. Detailed instructions of what to do with the replacement pages should be securely attached to the replacement pages.

ANNEX A

DETAILED SCOPE OF WORK

1. LOCATION

A. General description. The Architect Engineer (AE) shall furnish all services, materials, supplies, labor, equipment, investigations, studies, and travel as required in connection with the feasibility study for the below identified project in accordance with the contract and all furnished instructions:

INSTALLATION	DESCRIPTION
Fort Drum, NY	Expansion of Existing Emcs

B. The project consists of studying the feasibility of including buildings listed to the existing EMCS system. The buildings to be included are listed at the end of this Detailed Scope of Work.

2. AUTHORIZATION (Not Required)

3. STUDY INSTRUCTIONS

If the Design Manuals, Guide Specifications, and/or Project Engineering Instructions do not cover a specific condition in question, the AE shall contact the Contracting Officer before proceeding. If there is a conflict in Engineering Instructions or other reference data, such questions or conflicts should be brought to the attention of the Contracting Officer before proceeding.

4. INSTALLATION REPRESENTATIVE

The installation representative for this contract will be Mr. Steve Rowley, Energy Manager.

5. COMPLETION SCHEDULE

The following schedule shall be used as a guide in approving payments on this contract. The interim report for shall be due not later than 180 days after Notice to Proceed. The prefinal report shall be due not later than 45 days after the interim report review conference. The final report shall be due not later than 30 days after the prefinal review conference.

(3) CEGS 13945 - Multi-Building Expansion of Energy Monitoring and Control Systems

(4) CEGS 16795 - Fiber Optics Data Transmission System

H. "Site Survey Procedures for EMCS" HNDSP86-188-ED-ME"

I. "User Guide for single building Controllers UG-0010"

J. "EMCS Cost Estimating Guidelines" HNDSP90-244-ED-ME

K. Previous studies related to application of EMCS at this site (where applicable)

12. SUBMITTAL REQUIREMENTS

ORGANIZATION	COPIES REQUIRED (Correspondence); Interim; Final and Prefinal Review	Executive Summary, Only
10th Mountain Division (LI) and Ft. Drum 85 First Street West Fort Drum, NY 13602-5097 Attn: AFZS-EH-OM, Mr. Steve Rowley Field Survey - 1 Copy Computer Simulation - 1 Copy	5	
Norfolk District 803 Front Street Norfolk, VA 23510 Attn: CENAO-EN-MC, Jim Kendall	1	
U.S. Army Engineer Division, Huntsville 4930 Corporate Drive, Suite B Huntsville, AL 35805 Attn: CEHND-ED-ME	1	
Headquarters, Forces Command Energy Office, Building 200 Ft. McPherson, Ga 30330-6000 Attn: FCEN-RDF, Mr. Naresh Kapur		1
U.S. Army Engineer District, Mobile Post Office Box 2288 109 St. Joseph Street Mobile, AL 36602 Attn: CESAM-EN-CC, Anthony Battaglia		1

TYPICAL BUILDING	OCCUPANCY	SIMILAR BUILDINGS

CONFIRMATION NOTICE

Confirmation No. 1 EMC #P13F-030

DATE: 19 August 1994

PROJECT: FY 94/95 ECIP AND EEAP STUDY FOR BASEWIDE EMCS
FORT DRUM, NEW YORK

NOTES
PREPARED BY: Carl E. Lundstrom, EMC Engineers, Inc.

DATE OF
CONFERENCE: 16 August 1994

PLACE OF
CONFERENCE: Building T-400, Ft. Drum, NY

SUBJECT: UMCS Study Meeting

ATTENDEES: Jim Kendall, Norfolk District Corps of Engineers (804)-441-7403
Steve Rowley, Energy Manager, O&M DPW, Ft. Drum 315-772-5433
Thomas Ferguson, Chief, Mech. Branch, O&M DPW, Ft. Drum 315-772-4947
Glen Thompson, Foreman, Controls Group, O&M DPW, Ft. Drum 315-772-5388
Joe Ogiba, Telemetry Systems Manager, O&M DPW, Ft. Drum 315-772-3322
Carl E. Lundstrom, Proj. Manager, EMC Engineers, Inc. (404) 642-1864

The following is a summary of the items discussed during the EMCS meeting at Ft. Drum, NY, on 16 August 1994.

1. The old Post is W.W. II era. Some renovations have been performed on exteriors and furnaces, and some facilities are new. The old Post is heated with fuel oil.

2. The new Post, built in the 1980's, has new major buildings and family housing. The new Post is heated with HTHW.

3. The new Post and the old Post have no EMCS, except for a few buildings.

4. The four major building types on the new Post are as follows:

   - Barracks
   - Headquarters
   - Vehicle Maintenance
   - Mess Halls

5. The one-of-a-kind buildings include the following:

- Youth Activity
- Commissary
- PX
- Gymnasium
- Clinic
- SMA, Maintenance Shops.

6. Mr. Glen Thompson, Foreman, Ft. Drum Controls Group, discussed issues concerning the TRANE Tracer Program and Scientific Atlanta; Mr. Joe Ogiba, Ft. Drum, Telemetry Systems Manager, discussed issues concerning Bristol Babcock.

7. In 1985, Scientific Atlanta FM radio control was installed in the old Barracks. The EMCS study should include recommendations regarding interfacing the existing radio control with the EMCS.

8. The TRANE Tracer EMCS was installed as a building control system, basically for the NAF building. The TRANE Tracer EMCS is currently being considered for the following additional buildings:

- Commissary
- PX
- Youth Activity
- Bowling Alley.

The TRANE Tracer EMCS is being monitored at the heat shop via dial-up modems and PC. Some buildings have been added through construction and some through O&M work.

9. The following two EMCS options should be reviewed in the EMCS study:

(1) Two systems: The existing TRANE Tracer EMCS and a new EMCS system.

(2) One system: Replace the TRANE Tracer EMCS, with one new system and a new buildings.

10. It is the intention of Ft. Drum Management to retain Bristol Babcock SCADA for various utility applications.

11. Ft. Drum will install microprocessor-based Fire-Eye remote monitoring for boilers.

12. Inputs from the Bristol Babcock SCADA to the heat shop should be included for the EMCS for electrical substation demand monitoring.

13. Most of the Post has electric meters. Some buildings on the old Post need meters. Electric and HTHW meters should be added to the EMCS, per Ft. Drum.

14. The possibility of utilizing BACNET for the EMCS should be addressed in the EMCS study.

15. Component upgrades being considered are as follows:

    - Heating systems are undersized.
    - Return air should be included, to facilitate building warm-up.
    - The cost should be included for return air and controls for systems with 100% outside air.
    - The cost should be included for supplemental heating.

16. The possibility of using CO_2 to control ventilation should be reviewed in the EMCS study.

17. The operation and maintenance of the EMCS should be addressed.

18. Ft. Drum will provide the following building lists:

    - Buildings where return air needs to be added
    - Buildings which require additional heating.

19. Budget (rough) estimates will be provided for return air modifications and additional heating system modifications.

20. Extrapolation of energy savings calculations, building-to-building by square footage, is acceptable, due to the fact that buildings are very similar.

Carl E. Lundstrom, P.E.

If any portion of this confirmation notice is incorrect, please notify us immediately. If correspondence is not received to the contrary within 14 days, it will be assumed that the decisions and conclusion, and status outlined in this confirmation notice, are correct.

RESPONSES TO REVIEW COMMENTS
From Robert S. Woodruff, Dated 7 August 1995

1. During the course of the study, Steve Rowley removed several buildings from the original list. The major reason for the changes was the inadvertent inclusion of electric substations and demos. A few buildings were omitted due to incomplete information (per Steve Rowley). They will be included in the final submittal.

2. The electrical rate was approximated from the actual billing data provided by Steve Rowley. Later, the approximations were verified with the actual contract rate (within approximately $0.003 Per kWh).

3. The table incorrectly displayed cost rather than therms. The correction has been made.

4. The difference in maintenance cost between a new DDC system and the existing system is minimal. EMCS maintenance contracts frequently decrease as existing equipment ages, because replacement costs decrease. Also, in-house maintenance resources will stay constant regardless of the system chosen (it is unlikely there would be an increase or reduction in staff).

5. Duty cycling was not included in the study. The description of the function was included as a general reference.

6. Those buildings that have economizers are controlled by dry-bulb temperature sensors.

7. Per Steve Rowley's request, we have changed the annual maintenance costs to using in-house labor equal to the annual manhours savings ($56,820). The net result is zero labor savings.

8. The title has been change to read "Function and Manpower Savings" (see enclosed).

MOBILE DIST. OFFICE PROJECT REVIEW COMMENTS	DATE: 7 Aug 95	PAGE 1 of 1
TO: Army Corps of Engineers Norfolk District	FROM: (Section): EN-DM (Reviewer): Robert S. Woodruff	
PROJECT: Expansion of HMCS LOCATION: Ft. Drum , New York	Year:	Line Item No.:

Type of Action: Interim Report

Item No.	Drawing No. Or Par. No.	Comments	Review Action
1.	Scope of Work	On page 2-1 paragraph 2.2 states that 114 buildings were analyzed. The Scope of Work on page 1-1 indicates that 130 buildings are to be studied. Please explain this difference.	
2.	Energy Rate	The $ 0.0652 per kWh seems very high. Please verify this rate.	
3.	Nat. Gas Consump.	The chart on page 2-18 does not agree with the data presented in Table 2-6 on page 2-17.	
4.	Economic Summary	The Table on page 6-6 indicates that the maintenance cost of all three alternatives is the same. Because Alternatives 1 and 2 involve the old system the maintenance costs of these alternatives would logically be higher than the maintenance cost of a new system.	
5.	Appendix B. Page B-1	The description of Duty Cycling does not take into account how make-up air is provided where continuous exhaust systems are required.	
6.	Appendix B. Page B-3	Is the economizer to be used controled operated by dry bulb temperatures or anthalpy ?	
7.	Appendix D. Page Page D-20	Is there any scientific or practical basis for the manpower savings indicated in this table ?	
8.	Appendix E. Page E-1	Under the System Function Descriptions there is a listing for Manhours. This is not a system function.	

TO: WILLIAM CENTER 404-752-6739 (FAX)

FM: JIM KENDALL, COE NORFOLK DISTRICT 804-441-7403

SUBJ: EXTREMELY LATE COMMENTS FOR THE FORT DRUM BEAD STUDY

1. PLEASE REVIEW
2. CALL IF YOU HAVE ANY QUESTIONS.

THANK YOU

JK

MOBILE DIST. OFFICE PROJECT REVIEW COMMENTS	DATE: 7 Aug 95	PAGE 1 of 1
TO: Army Corps of Engineers Norfolk District	FROM: (Section): EN-DM (Reviewer): Robert S. Woodruff	
PROJECT: Expansion of EMCS LOCATION: Ft. Drum , New York	Year:	Line Item No.:

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TO: WILLIAM CENTER 904-552-6739 (FAX)

FM: JIM KENDALL, COE NORFOLK DISTRICT
804-441-7403

SUBJ: EXTREMELY LATE COMMENTS FOR THE FORT DRUM BEAP STUDY

1. PLEASE REVIEW
2. CALL IF YOU HAVE ANY QUESTIONS.

THANK YOU

RESPONSES TO REVIEW COMMENTS
From Robert S. Woodruff, Dated 7 August 1995

1. During the course of the study, Steve Rowley removed several buildings from the original list. The major reason for the changes was the inadvertent inclusion of electric substations and demos. A few buildings were omitted due to incomplete information (per Steve Rowley). They will be included in the final submittal.

2. The electrical rate was approximated from the actual billing data provided by Steve Rowley. Later, the approximations were verified with the actual contract rate (within approximately $0.003 Per kWh).

3. The table incorrectly displayed cost rather than therms. The correction has been made.

4. The difference in maintenance cost between a new DDC system and the existing system is minimal. EMCS maintenance contracts frequently decrease as existing equipment ages, because replacement costs decrease. Also, in-house maintenance resources will stay constant regardless of the system chosen (it is unlikely there would be an increase or reduction in staff).

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APPENDIX B

EMCS APPLICATION PROGRAMS

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EMCS APPLICATION PROGRAMS

This appendix contains descriptions of the EMCS application programs listed in Section 3.0 of this report.

B.1 ENERGY CONSERVING FUNCTIONS

B.1.1 Scheduled Start/Stop

Scheduled start/stop is the starting and stopping of a system based on the time and type of day. Type of day refers to weekdays, Saturdays, Sundays, holidays, or any other day with a specific schedule of operation. This is the simplest of all EMCS functions to install, maintain, and operate. It also provides the greatest potential for energy conservation if systems are currently operated unnecessarily during unoccupied hours. When applied to environmental systems, the function generally includes a temperature sensor in the conditioned space which prompts the EMCS to override the shutoff if the temperature goes below or above a certain level. Using this function in an EMCS for all applicable systems can potentially save fan motor or pump motor energy as well as energy used to heat outside air, by eliminating unnecessary operation of a system. Energy to heat outside air can be saved only in a system which brings in outside air.

B.1.2 Duty Cycling

Duty cycling consists of the shutdown of a system for predetermined short periods of time during normal operating hours. The function is based on the fact that HVAC systems seldom operate at peak output; thus, if a system is switched off for a short period of time, it has sufficient capacity to overcome the slight temperature drift which occurs during this shutdown. Although the interruption does not reduce the net space heating or cooling energy, it does reduce energy input to constant auxiliary loads such as fans and pumps. Cycling will reduce the heating and cooling loads by reducing the quantity of outside air admitted to the space when the supply fan is off. Systems are generally cycled off for a fixed period of time; for example, systems may be off 15 minutes out of each hour of operation. The off period should be adjusted automatically to satisfy space temperature conditions, which will result in a longer off period during moderate seasons and a shorter off period during peak seasons.

Duty cycling does produce additional wear on belts and motor starting circuits, especially when applied to large fans which develop high-torque loads during start-up.

B.1.3 Demand Limiting Start/Stop

Demand limiting software stops electrical loads to prevent setting a high electrical demand peak. The EMCS predicts demand on the basis of monitored data. When these predictions exceed preset limits, preselected electrical loads are shut off, thus reducing the rate of consumption and the predicted peak demand. Additional loads are turned off on a priority basis if the initial load shed action does not reduce the predicted demand sufficiently to satisfy the function requirements. As in duty cycling, a slight temperature drift must be allowed for shutting off the HVAC equipment. The duty cycling and demand limiting functions must be coordinated to prevent conflicting commands.

B.1.4 Direct Digital Control

During periods when HVAC equipment is operating, temperature control in spaces can be improved and controlled to chosen setpoints more closely by allowing the EMCS to provide direct digital control of the system. Some areas are currently overheating and overcooling and have little provision for temperature control; implementing direct digital control in those areas would involve controlling valves and dampers based on space temperature sensor input.

For the purposes of this analysis, the proposed occupied setpoints (after EMCS installation) are 68°F winter and 78°F summer.

B.1.5 Unoccupied Setback

The unoccupied setback function saves energy by decreasing heating temperatures and increasing cooling temperatures during hours when buildings are not occupied. This function would be applied in conjunction with the time scheduled start/stop function for cooling systems and forced air heating systems. The EMCS will set upper and lower temperature limits as a basis for determining when the HVAC system must operate.

The unoccupied setback function should not be applied to heating and cooling systems serving areas which require 24 hours of space conditioning, such as barracks, laboratory areas and computer rooms.

The proposed unoccupied temperature setpoints used in this analysis are 55°F for heating and 90°F for cooling.

B.1.6 Ventilation/ Recircuation Damper Control

A damper control interface allows the EMCS to close the outside air damper when the fan system must be operating but no ventilation is required. Damper control has the potential to save the

energy required to heat the outside air to environmental conditions; this function was considered on all systems which bring outside air into the space.

Ventilation levels were assumed to remain unchanged during occupied hours; therefore, savings were considered only during pre-occupancy warm-up.

B.1.7 Economizer

Using an outside air economizer cycle can be cost effective when applied to mechanical cooling systems. Where applicable, the cycle uses outside air to satisfy all or a portion of the cooling requirements of the building or zone when the temperature of the outside air is less than that of the return air from the space. Outside air is introduced through the mechanical system, and return air is exhausted rather than recirculated. When the temperature of the outside air is greater than that of the return air from the space, the EMCS positions the outside air damper to a minimum position.

B.1.8 Optimum Start/Stop

An additional feature of the time scheduled operation is the optimized start/stop feature available with the EMCS. Mechanical systems serving areas which are not occupied 24 hours a day or do not require special environmental conditions should be shut down during the unoccupied hours. Traditionally, the systems are restarted to cool or heat the space prior to occupancy, and then shut down at the end of the work day. Start/stop optimization usually works on a fixed schedule, independent of such factors as weather and space conditions. This software automatically starts and stops the system at times which will minimize the energy required to provide the desired environmental conditions during occupied hours. In addition, this function automatically evaluates the thermal inertia of the structure, the capacity of the system to either increase or reduce temperatures in the facility, start-up and shut-down times, and weather conditions. In this way, the EMCS can accurately determine the minimum hours of operation required of the HVAC system to satisfy the thermal requirements of the building.

B.1.9 Hot Water Outside Air Temperature Reset Schedule

This function was considered for hot water boilers and converters. Hot waters boilers and converters were originally installed to maintain satisfactory temperatures in the space during design weather conditions; consequently, the hot water supply temperature is higher than required when the heating requirements for the facility are reduced. For most facilities, this reduction in heating requirements is directly related to an increase in outdoor temperature. Where applicable, reducing the temperature of the supply water in response to outdoor temperature will affect operating savings. To accomplish this function, the temperature controller for the hot water supply is reset on a predetermined schedule in response to outdoor temperature.

B.1.10 Chilled Water Temperature Reset

The energy required to produce chilled water in a reciprocating or centrifugal machine is a function of the chilled water temperature as it leaves the machine; the higher the temperature, the lower the energy input per ton of refrigeration. This application program resets chilled water temperature upward until the required space temperature and humidity levels can no longer be maintained. This determination is made by monitoring the space temperatures and humidity.

B.2 EMCS MONITORING FUNCTION

B.2.1 Run-time Reports

Several maintenance procedures associated with mechanical equipment are related to the number of operating hours of the specific item of equipment. These maintenance functions include lubrication, bearing checks, and overhaul schedules. With run-time reports, maintenance functions can be performed closer to actual need, rather than on a calendar basis. No additional hardware is required to provide this function, because it is generated in software as a result of monitoring the motor status contact. This monitoring is required for the various start/stop functions.

B.2.2 Energy Metering

This software monitors and accepts readings from various energy meters and then totalizes the energy consumption (including BTu, flow, kW, or kWh) over 15 minute, hourly, daily, monthly, or yearly periods. The resulting values are stored in memory and can be printed in a report format upon the operator's request.

B.2.3 Temperature Monitoring

This function provides the system operator with the space temperature of a given area or the operating temperature of a given piece of equipment and will signal the system operator if these temperatures drift outside their programmed limits. The space temperature in a computer room is an example of this function.

B.2.4 Status Condition Monitoring

This function is provided for all equipment directly controlled by the EMCS. It allows the EMCS operator to ensure that equipment scheduled to be operating at a given time is actually operating and that equipment scheduled to be off at a given time is indeed off. Without this

function unauthorized personnel could easily circumvent EMCS control of a given piece of equipment, and the EMC operator would not know.

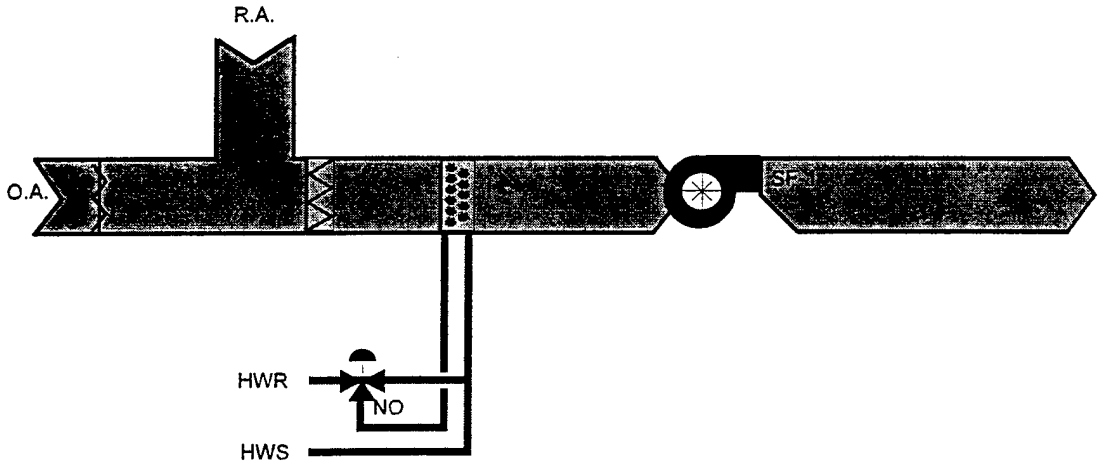
APPENDIX C

TYPICAL HVAC SYSTEM

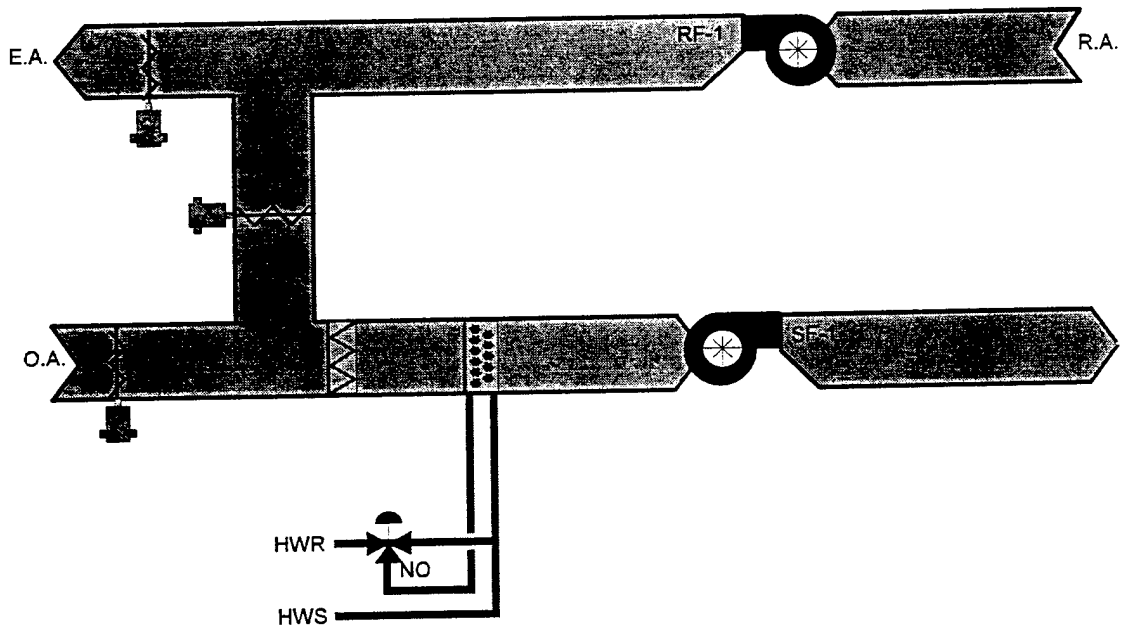
APPENDIX C.1

TYPICAL HVAC SYSTEM SCHEMATICS

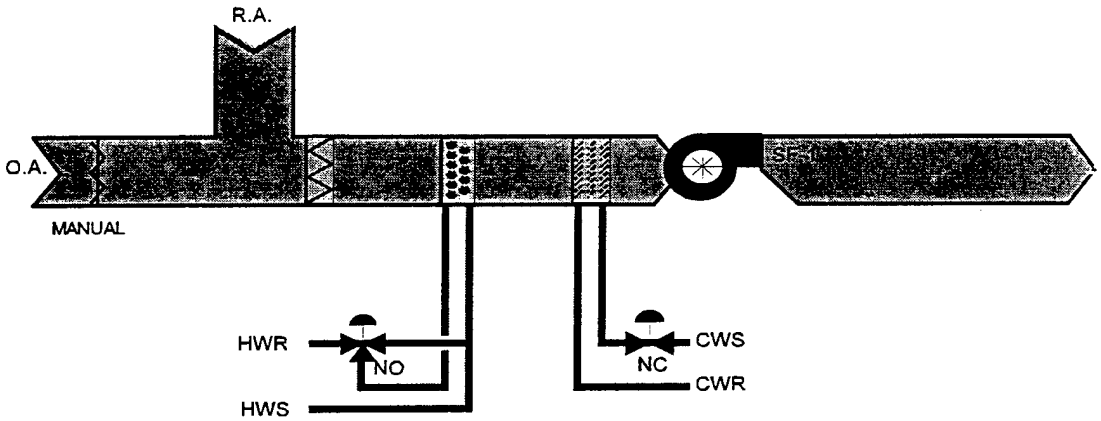
1.HEATING AND VENTILATING UNIT WITHOUT RETURN FAN



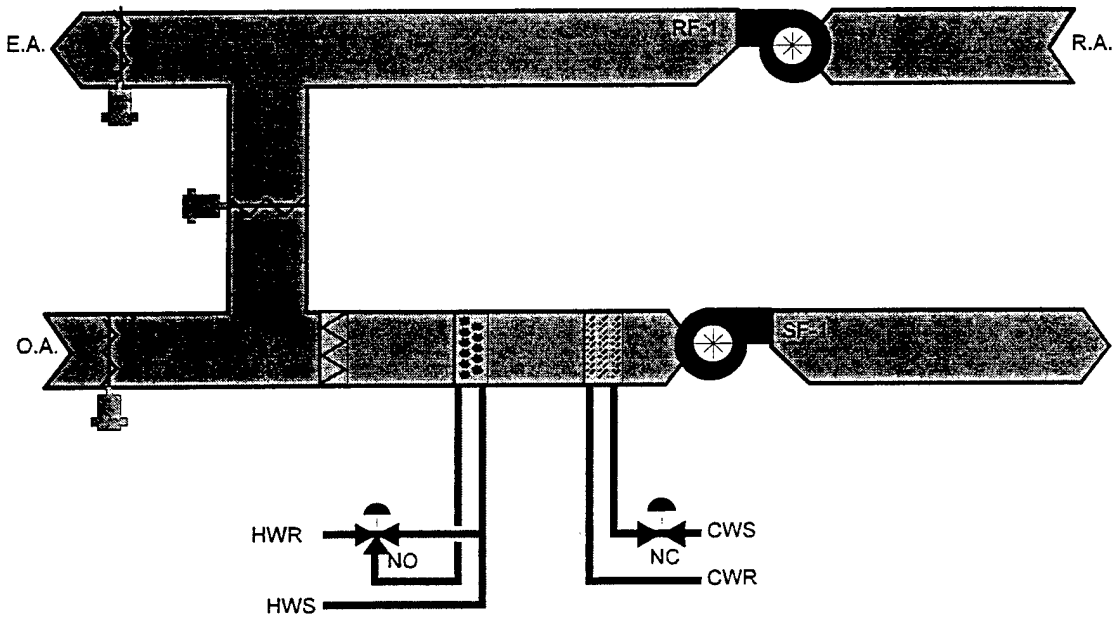
2. HEATING AND VENTILATING UNIT



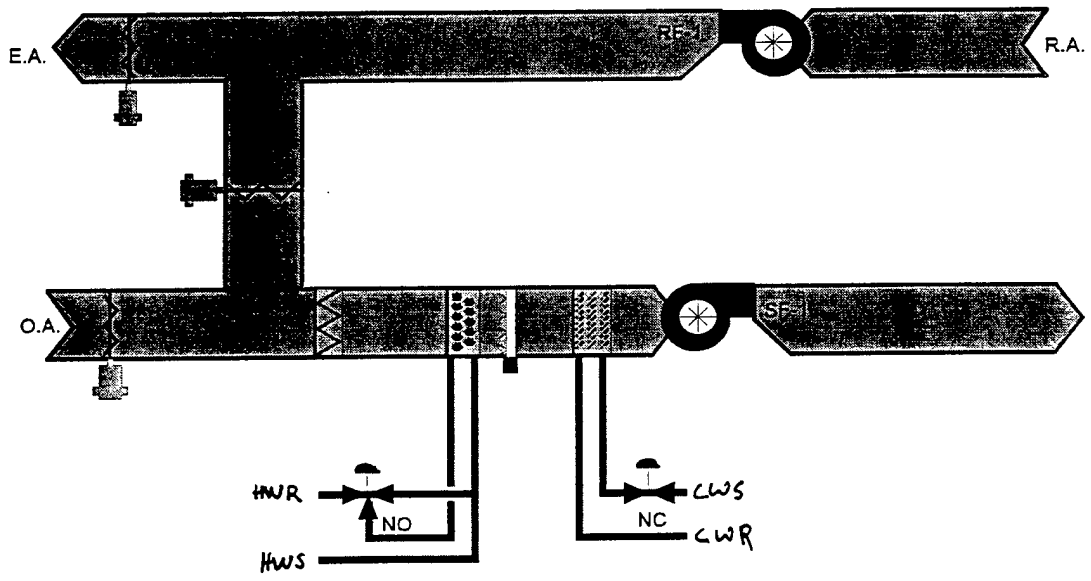
3. SINGLE ZONE AHU WITHOUT RETURN FAN



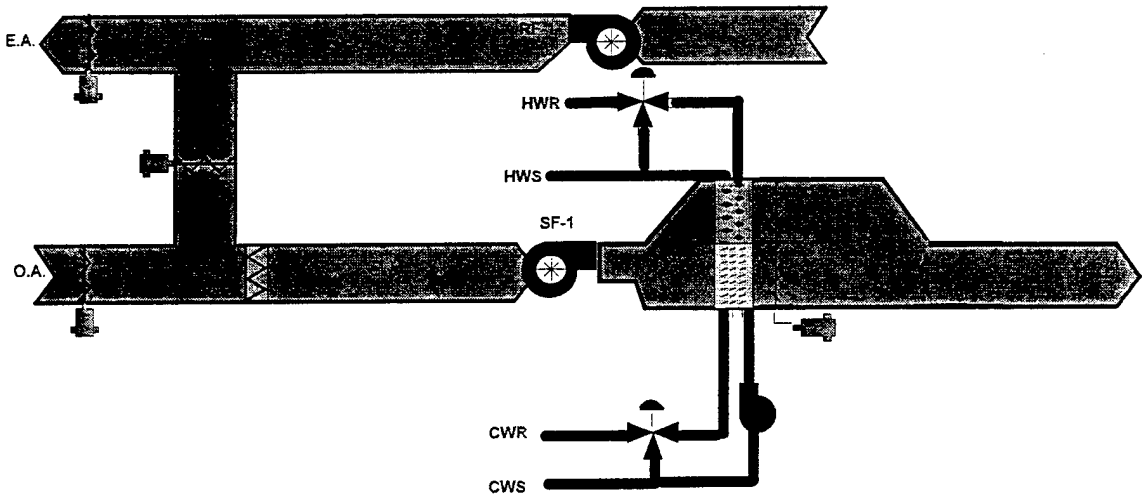
4. SINGLE ZONE AHU

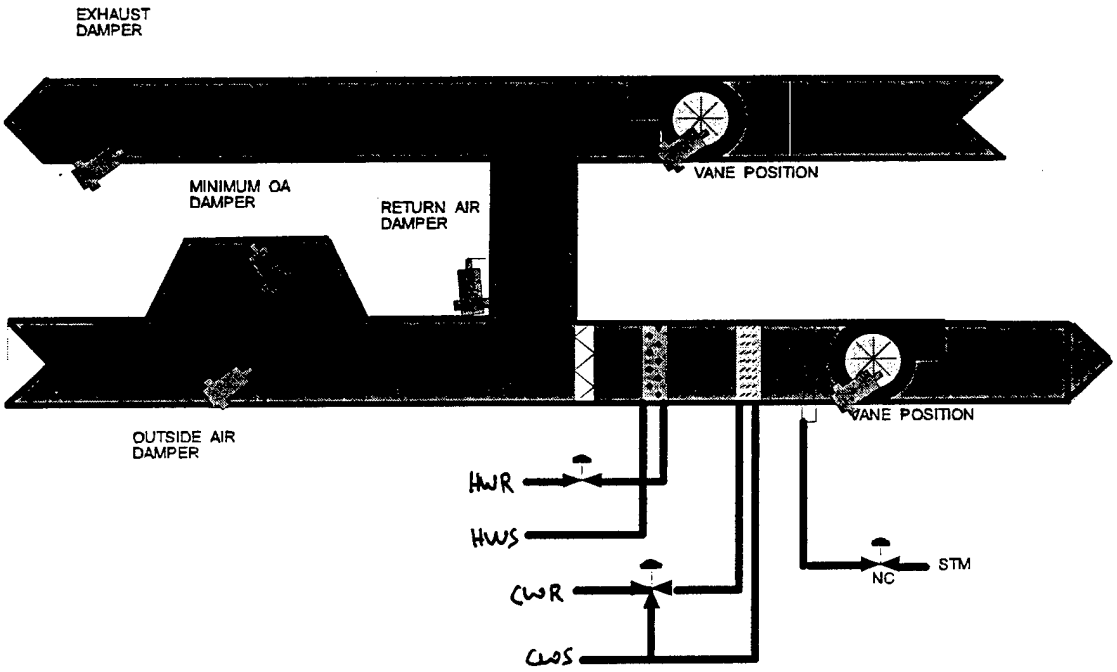


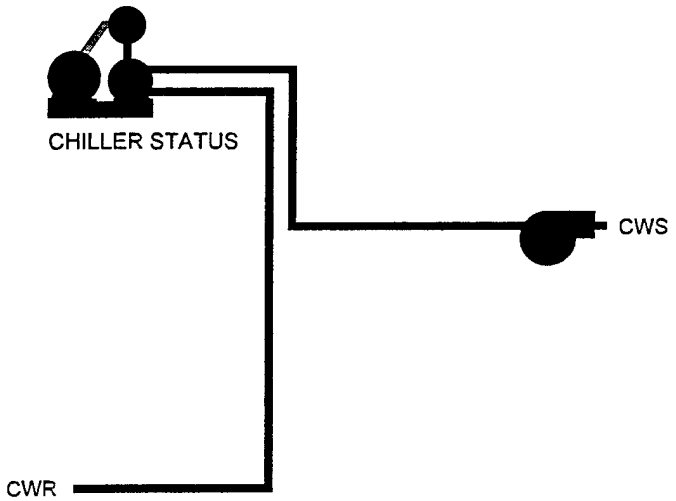
5. SINGLE ZONE AHU WITH HUMIDIFICATION



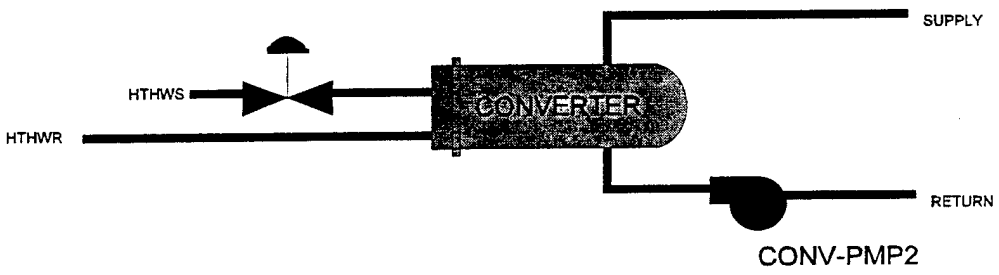
6. MULTI-ZONE AHU



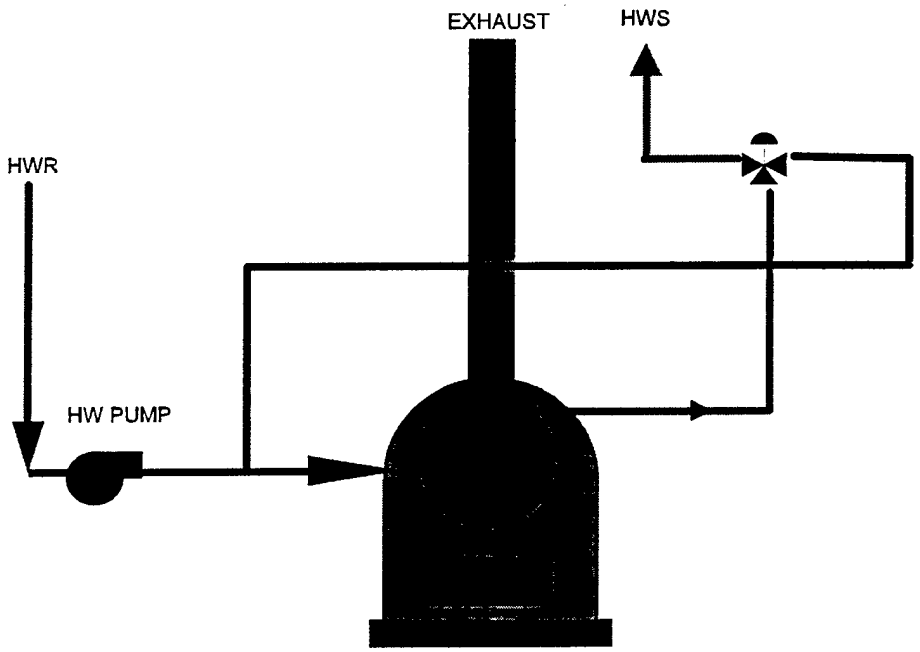

EXHAUST
DAMPER
MINIMUM OA
DAMPER
RETURN AIR
DAMPER
VANE POSITION
OUTSIDE AIR
DAMPER
VANE POSITION
HWR
HWS
CWR
CWS
NC
STM


CHILLER STATUS
CWS
CWR

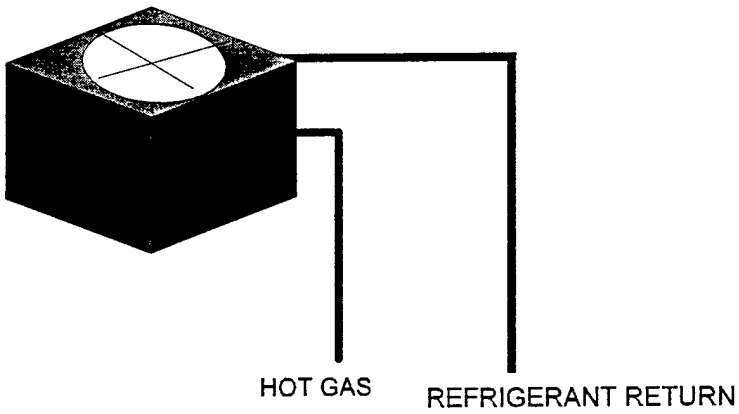
9. CONVERTER AND PUMPS

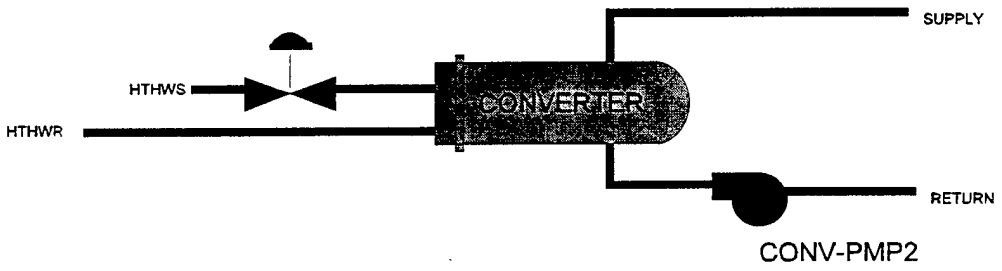


10. HOT WATER BOILER AND PUMPS

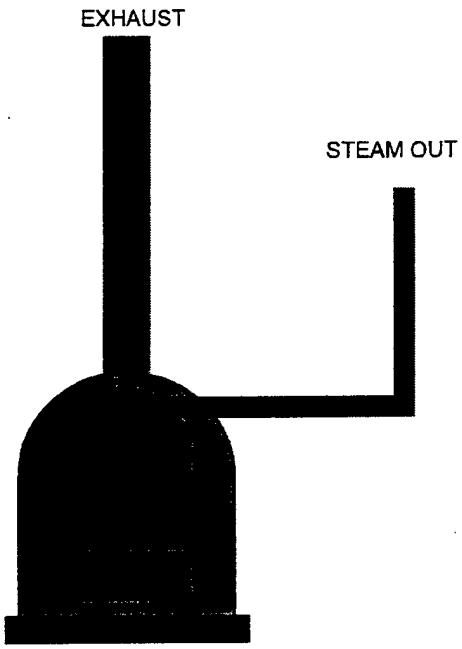


11. CONDENSING UNIT




SUPPLY
HTHWS
CONVERTER
HTHWR
RETURN
CONV-PMP2

13. STEAM HUMIDIFICATION



14. VENTILATION UNIT

APPENDIX C.2

TYPICAL HVAC SYSTEM
I/O SUMMARY TABLES

The I/O summary tables in Appendix C indicate typical HVAC systems and the proposed EMCS hardware configurations.

TYPICAL HVAC SYSTEM NO. 1

HEATING AND VENTILATING UNIT WITHOUT RETURN FAN

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

H&V UNIT WITHOUT RETURN FAN

SYSTEM TYPE
1

GRAPHIC DISPLAY	HARDWARE: OUTPUT / DIGITAL: CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT	SOLENOID	OUTPUT / ANALOG: POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	INPUT / DIGITAL: PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	INPUT / ANALOG: SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS	OUTSIDE AIR TEMPERATURE	ALARM / DIG: CONTACT CLOSURE	ALARM / ANA: HIGH LIMIT	LOW LIMIT	RUN TIME	SOFTWARE / APPLICATION PROGRAMS: SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	DDC PROGRAMS: PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
SUPPLY FAN	(10)												(10)																		(10)			(10)	(10)	(10)	(10)															O
OA DAMPER					(10)																										(10)																			F
HEATING COIL						(10)																																													O
SUPPLY AIR																						(10)										(10)	(10)																			
SPACE																				(10)												(10)	(10)		(10)					(10)											
OUTSIDE AIR (COMMON)																																										(10)										
TOTAL	1				1	1							1							1		1																													

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

TYPICAL HVAC SYSTEM NO. 2

HEATING AND VENTILATING UNIT

I/O SUMMARY TABLE

Date Prepared
13-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

H&V UNIT

SYSTEM TYPE
2

HARDWARE

OUTPUT — DIGITAL: CONTROL RELAY W/H-O-A; CONTROL RELAY; CONTROL RELAY W/CONTACT; SOLENOID

OUTPUT — ANALOG: POSITION DAMPER; POSITION VALVE; POSITION DECK; CPA; ADJUST SPEED

INPUT — DIGITAL: PRESSURE SWITCH; DIFF. PRESS. SW. (AIR); DIFF. PRESS. SW. (WATER); CURRENT SWITCH; AUXILIARY CONTACT; PULSE; STATUS RELAY; END POSITION SWITCH; TEMPERATURE SWITCH; LEVEL SWITCH

INPUT — ANALOG: SPACE TEMPERATURE; SPACE TEMPERATURE (VAV); DUCT TEMPERATURE; AVG. TEMPERATURE; WATER TEMPERATURE; SPACE RELATIVE HUMIDITY; DUCT RELATIVE HUMIDITY; PSI/PSIG; FLOW; kW; AMPS; OUTSIDE AIR TEMPERATURE

ALARM — DIG: CONTACT CLOSURE

ALARM — ANA: HIGH LIMIT; LOW LIMIT; RUN TIME

SOFTWARE

APPLICATION PROGRAMS: SCHEDULE START/STOP; OPTIMUM START/STOP; DUTY CYCLING; DEMAND LIMITING; DAY/NIGHT SETBACK; ECONOMIZER; VENTILATION/RECIRCULATION; HOT/COLD DECK RESET; REHEAT COIL RESET; HW OA RESET; CHILLED WATER RESET; CHILLER DEMAND LIMIT; AIR VOLUME CONTROL; CONDENSER WATER RESET

DDC PROGRAMS: PROPORTIONAL CONTROL; PI CONTROL; PID CONTROL

FAILURE MODE

GRAPHIC DISPLAY (C)	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT	SOLENOID	POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS	OUTSIDE AIR TEMPERATURE	CONTACT CLOSURE	HIGH LIMIT	LOW LIMIT	RUN TIME	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL	FAILURE MODE
SUPPLY FAN	(19)												(16)																			(15)			(18)	(17)	(15)	(18)		(16)												O
RETURN FAN													(16)																			(14)			(18)	(15)	(18)	(17)		(16)												O
OA DAMPER					(18)																																				(11)											F
HEATING COIL						(18)																																														O
SUPPLY AIR																						(19)												(19)	(18)																			O
SPACE																					(19)													(19)	(18)			(18)			(16)												
OUTSIDE AIR (COMMON)																																										(16)												
TOTAL	1				1	1							2								1		1																															

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

SYS-2CS.WK4

TYPICAL HVAC SYSTEM NO. 3

SINGLE ZONE AHU WITHOUT RETURN FAN

I/O SUMMARY TABLE

Date Prepared
13-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

SINGLE ZONE AHU WITHOUT RETURN FAN

SYSTEM TYPE
3

HARDWARE – OUTPUT

	DIGITAL					ANALOG				
	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID		POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED
GRAPHIC DISPLAY ●										
SUPPLY FAN	●									
OA DAMPER						●				
COOLING COIL							●			
HEATING COIL							●			
SUPPLY AIR										
SPACE										
OUTSIDE AIR (COMMON)										
TOTAL	1					1	2			

HARDWARE – INPUT

	DIGITAL										ANALOG												
	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS		OUTSIDE AIR TEMPERATURE
SUPPLY FAN				●																			
OA DAMPER																							
COOLING COIL																							
HEATING COIL																							
SUPPLY AIR													●										
SPACE											●												
OUTSIDE AIR (COMMON)																							
TOTAL				1							1		1										

HARDWARE – ALARM / SOFTWARE

	ALARM DIG		ALARM ANA			APPLICATION PROGRAMS														DDC PROGRAMS				
	CONTACT CLOSURE		HIGH LIMIT	LOW LIMIT	RUN TIME	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
SUPPLY FAN	●				●	●	●	●		●														O
OA DAMPER												●												F
COOLING COIL																					●			F
HEATING COIL																					●			O
SUPPLY AIR			●	●																				
SPACE			●	●			●			●														
OUTSIDE AIR (COMMON)										●														

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

SYS-3CS.WK4

TYPICAL HVAC SYSTEM NO. 4

SINGLE ZONE AHU

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

SINGLE ZONE AHU

SYSTEM TYPE
4

GRAPHIC DISPLAY	HARDWARE: OUTPUT: DIGITAL: CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACTK	SOLENOID	OUTPUT: ANALOG: POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	INPUT: DIGITAL: PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	INPUT: ANALOG: SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS	OUTSIDE AIR TEMPERATURE	ALARM: DIG: CONTACT CLOSURE	ALARM: ANA: HIGH LIMIT	LOW LIMIT	RUN TIME	SOFTWARE: APPLICATION PROGRAMS: SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	DDC PROGRAMS: PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
SUPPLY FAN	(16)												(10)																		(16)			(16)	(15)	(10)	(07)	(09)	(05)													O
RETURN FAN													(10)																		(16)			(11)	(15)	(10)	(07)	(09)	(05)													O
RETURN AIR																						(16)										(12)	(13)																		
MIXED AIR																							(16)									(10)	(16)																		
OA/RA/EA DAMPERS					(20)																											(14)																		
HEATING COIL						(19)																																												F
COOLING COIL						(19)																																											O
SUPPLY AIR																						(16)											(15)	(08)				(10)			(14)		(17)								
SPACE																					(18)												(15)	(08)				(10)			(14)		(17)								
OUTSIDE AIR (COMMON)																																										(15)									
TOTAL	1				1	2							2							1		2	1																											

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

TYPICAL HVAC SYSTEM NO. 5

SINGLE ZONE AHU WITH HUMIDIFICATION

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

SINGLE ZONE AHU WITH HUMIDIFICATION

SYSTEM TYPE 5

HARDWARE — OUTPUT (DIGITAL, ANALOG) / INPUT (DIGITAL)

	OUTPUT DIGITAL: CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID	OUTPUT ANALOG: POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	INPUT DIGITAL: PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH
GRAPHIC DISPLAY ●																			
SUPPLY FAN	●												●						
RETURN FAN													●						
RETURN AIR																			
MIXED AIR																			
OA/RA/EA DAMPERS					●														
HEATING COIL						●													
COOLING COIL						●													
SUPPLY AIR																			
SPACE																			
SPACE																			
OUTSIDE AIR (COMMON)																			
TOTAL	1				1	2							2						

HARDWARE — INPUT (ANALOG) / ALARM (DIG, ANA)

	INPUT ANALOG: SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS	OUTSIDE AIR TEMPERATURE	ALARM DIG: CONTACT CLOSURE	ALARM ANA: HIGH LIMIT	LOW LIMIT	RUN TIME
SUPPLY FAN													●			●
RETURN FAN													●			●
RETURN AIR			●											●	●	
MIXED AIR				●										●	●	
OA/RA/EA DAMPERS																
HEATING COIL																
COOLING COIL																
SUPPLY AIR			●											●	●	
SPACE	●													●	●	
SPACE						●								●	●	
OUTSIDE AIR (COMMON)																
TOTAL	1		2	1		1										

SOFTWARE — APPLICATION PROGRAMS / DDC PROGRAMS

	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	DDC: PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL	FAILURE MODE
SUPPLY FAN	●	●	●		●													O
RETURN FAN	●	●	●		●													O
RETURN AIR						●	●											
MIXED AIR						●												
OA/RA/EA DAMPERS						●												
HEATING COIL																●		F
COOLING COIL																●		O
SUPPLY AIR		●			●		●											
SPACE		●			●		●											
SPACE																		
OUTSIDE AIR (COMMON)					●													

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

TYPICAL HVAC SYSTEM NO. 6

MULTI-ZONE AHU

I/O SUMMARY TABLE

Date Prepared 12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER MULTI-ZONE AHU SYSTEM TYPE 6	HARDWARE																																						SOFTWARE																		
	OUTPUT										INPUT																							ALARM					APPLICATION PROGRAMS														DDC PROGRAMS				
	DIGITAL					ANALOG					DIGITAL										ANALOG													DIG		ANA																					
	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID		POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS		OUTSIDE AIR TEMPERATURE	CONTACT CLOSURE		HIGH LIMIT	LOW LIMIT	RUN TIME	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
GRAPHIC DISPLAY ●																																																									
SUPPLY FAN	●													●																				●				●	●	●	●		●														O
RETURN FAN														●																				●				●	●	●	●		●														O
RETURN AIR																							●													●	●							●	●												
MIXED AIR																								●												●	●							●													
OA/RA/EA DAMPERS						●																																						●													
COLD DECK								●															●													●	●									●								●			F
HOT DECK								●															●													●	●									●								●			O
SPACE ZONE 1						●															●															●	●			●			●		●	●								●			
SPACE ZONE 2						●															●															●	●			●			●		●	●								●			
SPACE ZONE 3						●															●															●	●			●			●		●	●								●			
SPACE ZONE 4						●															●															●	●			●			●		●	●								●			
OUTSIDE AIR (COMMON)																																											●														
TOTAL	1					5		2						2							4		3	1																																	

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

TYPICAL HVAC SYSTEM NO. 7

VAV AHU

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

VAV AHU

SYSTEM TYPE
7

GRAPHIC DISPLAY (1)	HARDWARE: OUTPUT / DIGITAL: CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID	OUTPUT / ANALOG: POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	INPUT / DIGITAL: PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	INPUT / ANALOG: SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	KW	AMPS	OUTSIDE AIR TEMPERATURE	ALARM / DIG: CONTACT CLOSURE	ALARM / ANA: HIGH LIMIT	LOW LIMIT	RUN TIME	SOFTWARE / APPLICATION PROGRAMS: SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	DDC PROGRAMS: PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL	FAILURE MODE
SUPPLY FAN	(16)												(19)																	(15)			(20)	(21)	(22)	(23)	(24)														O
RETURN FAN													(19)																	(15)			(20)	(21)	(22)	(23)	(24)														O
RETURN AIR																					(17)										(18)	(19)								(25)	(26)										
MIXED AIR																						(17)									(18)	(19)									(27)										
MIN. OA DAMPER				(18)																																					(28)										F
OA/RA/EA DAMPERS					(17)																																				(25)										
HEATING COIL						(19)																																						(29)							F
COOLING COIL						(19)																																						(30)							O
SUPPLY/RETURN FAN VAV					(17)																						(16)				(18)	(19)											(30)							C
SUPPLY AIR																						(17)									(18)	(19)			(31)				(25)		(32)									
SPACE																				(20)											(18)	(19)			(31)				(25)		(32)									
SPACE																				(20)											(18)	(19)			(31)				(25)		(32)									
OUTSIDE AIR (COMMON)																																										(33)									
TOTAL	1			1	2	2							2							2		2	1				1																								

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

SYS-7CS.WK4

TYPICAL HVAC SYSTEM NO. 8

CHILLER AND PUMPS

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

CHILLER AND PUMPS

SYSTEM TYPE
8

HARDWARE

OUTPUT — DIGITAL: CONTROL RELAY W/H-O-A; CONTROL RELAY; CONTROL RELAY W/CONTACT; SOLENOID

OUTPUT — ANALOG: POSITION DAMPER; POSITION VALVE; POSITION DECK; CPA; ADJUST SPEED

INPUT — DIGITAL: PRESSURE SWITCH; DIFF. PRESS. SW. (AIR); DIFF. PRESS. SW. (WATER); CURRENT SWITCH; AUXILIARY CONTACT; PULSE; STATUS RELAY; END POSITION SWITCH; TEMPERATURE SWITCH; LEVEL SWITCH

INPUT — ANALOG: SPACE TEMPERATURE; SPACE TEMPERATURE (VAV); DUCT TEMPERATURE; AVG. TEMPERATURE; WATER TEMPERATURE; SPACE RELATIVE HUMIDITY; DUCT RELATIVE HUMIDITY; PSI/PSIG; FLOW; kW; AMPS; OUTSIDE AIR TEMPERATURE

ALARM — DIG: CONTACT CLOSURE

ALARM — ANA: HIGH LIMIT; LOW LIMIT; RUN TIME

SOFTWARE

APPLICATION PROGRAMS: SCHEDULE START/STOP; OPTIMUM START/STOP; DUTY CYCLING; DEMAND LIMITING; DAY/NIGHT SETBACK; ECONOMIZER; VENTILATION/RECIRCULATION; HOT/COLD DECK RESET; REHEAT COIL RESET; HW OA RESET; CHILLED WATER RESET; CHILLER DEMAND LIMIT; AIR VOLUME CONTROL; CONDENSER WATER RESET

DDC PROGRAMS: PROPORTIONAL CONTROL; PI CONTROL; PID CONTROL

FAILURE MODE

GRAPHIC DISPLAY	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT	SOLENOID	POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS	OUTSIDE AIR TEMPERATURE	CONTACT CLOSURE		HIGH LIMIT	LOW LIMIT	RUN TIME	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
AIR COOLED CHILLER	(18)												(19)																		(19)				(19)																				O
CHILLED WATER PUMP	(18)												(19)																		(19)				(19)	(19)																		O
CHILLED WATER SUPPLY																								(18)									(18)	(18)															(18)					
CHILLED WATER RETURN																								(18)									(18)	(18)																				
OUTSIDE AIR (COMMON)																																									(17)													
TOTAL	2												2												2																															

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

SYS-8CS.WK4

TYPICAL HVAC SYSTEM NO. 9

CONVERTER AND PUMPS

I/O SUMMARY TABLE

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

BUILDING NUMBER

CONVERTER AND PUMPS

SYSTEM TYPE
9

HARDWARE — OUTPUT

	DIGITAL: CONTROL RELAY W/H-O-A	DIGITAL: CONTROL RELAY	DIGITAL: CONTROL RELAY W/CONTACT	DIGITAL: SOLENOID	DIGITAL:	ANALOG: POSITION DAMPER	ANALOG: POSITION VALVE	ANALOG: POSITION DECK	ANALOG: CPA	ANALOG: ADJUST SPEED
GRAPHIC DISPLAY ●										
CONVERTER										
STEAM VALVE							●			
HW SUPPLY										
HW RETURN										
HW PUMP	●									
OUTSIDE AIR (COMMON)										
TOTAL	1						1			

HARDWARE — INPUT — DIGITAL

	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH
GRAPHIC DISPLAY ●										
CONVERTER										
STEAM VALVE										
HW SUPPLY										
HW RETURN										
HW PUMP				●						
OUTSIDE AIR (COMMON)										
TOTAL				1						

HARDWARE — INPUT — ANALOG

	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS		OUTSIDE AIR TEMPERATURE
GRAPHIC DISPLAY ●													
CONVERTER													
STEAM VALVE													
HW SUPPLY					●								
HW RETURN					●								
HW PUMP													
OUTSIDE AIR (COMMON)													
TOTAL					2								

ALARM

	DIG: CONTACT CLOSURE	DIG:	ANA: HIGH LIMIT	ANA: LOW LIMIT	ANA: RUN TIME
GRAPHIC DISPLAY ●					
CONVERTER					
STEAM VALVE					
HW SUPPLY			●	●	
HW RETURN			●	●	
HW PUMP	●				●
OUTSIDE AIR (COMMON)					

SOFTWARE — APPLICATION PROGRAMS

	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET
GRAPHIC DISPLAY ●														
CONVERTER														
STEAM VALVE										●				
HW SUPPLY										●				
HW RETURN														
HW PUMP	●	●			●									
OUTSIDE AIR (COMMON)					●									

SOFTWARE — DDC PROGRAMS

	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
GRAPHIC DISPLAY ●					
CONVERTER					
STEAM VALVE		●			F
HW SUPPLY					
HW RETURN					
HW PUMP					O
OUTSIDE AIR (COMMON)					

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

SYS-9CS.WK4

TYPICAL HVAC SYSTEM NO. 10

HOT WATER BOILER AND PUMPS

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

HOT WATER BOILER AND PUMPS

SYSTEM TYPE 10

GRAPHIC DISPLAY 10

HARDWARE

	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID		POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS		OUTSIDE AIR TEMPERATURE	CONTACT CLOSURE		HIGH LIMIT	LOW LIMIT	RUN TIME
	OUTPUT DIGITAL					OUTPUT ANALOG					INPUT DIGITAL										INPUT ANALOG													ALARM DIG		ALARM ANA		
HW BOILER																	10																					10
HW PUMP	10													10																				10				10
HW SUPPLY																									10											10	10	
HW RETURN																									10											10	10	
OUTSIDE AIR (COMMON)																																						
TOTAL	1													1			1								2													

SOFTWARE

	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
	APPLICATION PROGRAMS														DDC PROGRAMS				
HW BOILER																			
HW PUMP	10	10			10														O
HW SUPPLY										10									
HW RETURN										10									
OUTSIDE AIR (COMMON)					10														

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

TYPICAL HVAC SYSTEM NO. 11

CONDENSING UNIT

I/O SUMMARY TABLE

I/O SUMMARY TABLE

Date Prepared 12-Apr-95

BUILDING NUMBER

CONDENSING UNIT

SYSTEM TYPE 11

GRAPHIC DISPLAY ●

HARDWARE — OUTPUT

	DIGITAL					ANALOG				
	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID		POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED
CONDENSING UNIT	⑩									
OUTSIDE AIR (COMMON)										
TOTAL	1									

HARDWARE — INPUT (DIGITAL)

	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH
CONDENSING UNIT				⑩						
OUTSIDE AIR (COMMON)										
TOTAL				1						

HARDWARE — INPUT (ANALOG)

	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS		OUTSIDE AIR TEMPERATURE
CONDENSING UNIT													
OUTSIDE AIR (COMMON)													
TOTAL													

HARDWARE — ALARM

	DIG		ANA		
	CONTACT CLOSURE		HIGH LIMIT	LOW LIMIT	RUN TIME
CONDENSING UNIT					⑩
OUTSIDE AIR (COMMON)					
TOTAL					

SOFTWARE

	APPLICATION PROGRAMS														DDC PROGRAMS				
	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
CONDENSING UNIT	⑩																		O
OUTSIDE AIR (COMMON)					●														

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

SYS-11CS.WK4

TYPICAL HVAC SYSTEM NO. 12

BASEBOARD RADIATION

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER

BASEBOARD RADIATION

SYSTEM TYPE 12

GRAPHIC DISPLAY ●

HARDWARE – OUTPUT	DIGITAL					ANALOG				
	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID		POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED
CONVERTER										
STEAM VALVE							●			
HW SUPPLY										
HW PUMP	●									
SPACE										
SPACE										
OUTSIDE AIR (COMMON)										
TOTAL	1						1			

HARDWARE – INPUT	DIGITAL										ANALOG												
	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS		OUTSIDE AIR TEMPERATURE
CONVERTER																							
STEAM VALVE																							
HW SUPPLY															●								
HW PUMP				●																			
SPACE											●												
SPACE											●												
OUTSIDE AIR (COMMON)																							
TOTAL				1							2				1								

	ALARM – DIG		ALARM – ANA			SOFTWARE – APPLICATION PROGRAMS														DDC PROGRAMS				
	CONTACT CLOSURE		HIGH LIMIT	LOW LIMIT	RUN TIME	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
CONVERTER																								
STEAM VALVE															●						●			F
HW SUPPLY			●	●											●									
HW PUMP	●				●	●	●			●														O
SPACE			●	●											●									
SPACE			●	●											●									
OUTSIDE AIR (COMMON)										●														

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

TYPICAL HVAC SYSTEM NO. 13

STEAM BOILER (HUMIDIFIER)

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

BUILDING NUMBER	HARDWARE																																						SOFTWARE																		
STEAM BOILER (HUMIDIFIER)	OUTPUT										INPUT																							ALARM					APPLICATION PROGRAMS														DDC PROGRAMS				
SYSTEM TYPE 13	DIGITAL					ANALOG					DIGITAL										ANALOG													DIG		ANA																					
GRAPHIC DISPLAY ⑩	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID		POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS		OUTSIDE AIR TEMPERATURE	CONTACT CLOSURE		HIGH LIMIT	LOW LIMIT	RUN TIME	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
STAEM BOILER (MONITORING ONLY)																												⑩																													
OUTSIDE AIR (COMMON)																																											●														
TOTAL																												1																													

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

TYPICAL HVAC SYSTEM NO. 14

VENTILATION UNIT

I/O SUMMARY TABLE

Date Prepared
12-Apr-95

I/O SUMMARY TABLE

	CONTROL RELAY W/H-O-A	CONTROL RELAY	CONTROL RELAY W/CONTACT(	SOLENOID		POSITION DAMPER	POSITION VALVE	POSITION DECK	CPA	ADJUST SPEED	PRESSURE SWITCH	DIFF. PRESS. SW. (AIR)	DIFF. PRESS. SW. (WATER)	CURRENT SWITCH	AUXILIARY CONTACT	PULSE	STATUS RELAY	END POSITION SWITCH	TEMPERATURE SWITCH	LEVEL SWITCH	SPACE TEMPERATURE	SPACE TEMPERATURE (VAV)	DUCT TEMPERATURE	AVG. TEMPERATURE	WATER TEMPERATURE	SPACE RELATIVE HUMIDITY	DUCT RELATIVE HUMIDITY	PSI/PSIG	FLOW	kW	AMPS		OUTSIDE AIR TEMPERATURE	CONTACT CLOSURE		HIGH LIMIT	LOW LIMIT	RUN TIME
BUILDING NUMBER	HARDWARE																																					
VENTILATION UNIT	OUTPUT										INPUT																							ALARM				
SYSTEM TYPE 14	DIGITAL					ANALOG					DIGITAL										ANALOG													DIG		ANA		
GRAPHIC DISPLAY ●																																						
SUPPLY FAN	●													●																				●				●
SPACE																					●															●	●	
OUTSIDE AIR (COMMON)																																						
TOTAL	1													1							1																	

	SCHEDULE START/STOP	OPTIMUM START/STOP	DUTY CYCLING	DEMAND LIMITING	DAY/NIGHT SETBACK	ECONOMIZER	VENTILATION/RECIRCULATION	HOT/COLD DECK RESET	REHEAT COIL RESET	HW OA RESET	CHILLED WATER RESET	CHILLER DEMAND LIMIT	AIR VOLUME CONTROL	CONDENSER WATER RESET	PROPORTIONAL CONTROL	PI CONTROL	PID CONTROL		FAILURE MODE
	SOFTWARE																		
	APPLICATION PROGRAMS														DDC PROGRAMS				
SUPPLY FAN	●	●	●		●														O
SPACE		●			●														
OUTSIDE AIR (COMMON)					●														

C - LAST COMMAND
H - HIGH VALUE
L - LOW VALUE

O - ON (OPEN)
F - OFF (CLOSED)
N - LOCAL LOOP

SYS-14CS.WK4

APPENDIX C.3

TYPICAL HVAC SYSTEM COST ESTIMATES

TYPICAL HVAC SYSTEM NO. 1

HEATING AND VENTILATING UNIT WITHOUT RETURN FAN

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 1
System Type H&V UNIT WITHOUT RETURN FAN

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	2	EA	2.83	5.65	25.42	$144	99.50	$199			$343
CURRENT SWITCH	1	EA	1.83	1.83	25.42	$46	105.50	$106			$152
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	1	EA	2.83	2.83	25.42	$72	71.50	$72			$143
DUCT TEMPERATURE	1	EA	2.83	2.83	25.42	$72	120.00	$120			$192
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$405		$562			$967

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 1
System Type H&V UNIT WITHOUT RETURN FAN

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	1	1	1	1	$604
2	Economizer					
3	DDC		1		1	$363
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1	2	1	2	$967

TYPICAL HVAC SYSTEM NO. 2

HEATING AND VENTILATING UNIT

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 2
System Type H&V UNIT

Date 13-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	2	EA	2.83	5.65	25.42	$144	99.50	$199			$343
CURRENT SWITCH	2	EA	1.83	3.65	25.42	$93	105.50	$211			$304
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	1	EA	2.83	2.83	25.42	$72	71.50	$72			$143
DUCT TEMPERATURE	1	EA	2.83	2.83	25.42	$72	120.00	$120			$192
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$452		$667			$1,119

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 2
System Type H&V UNIT

Date 13-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE DO	AO	DI	AI	TOTAL
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	1	1	2	1	$756
2	Economizer					
3	DDC		1		1	$363
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1	2	2	2	$1,119

TYPICAL HVAC SYSTEM NO. 3

SINGLE ZONE AHU WITHOUT RETURN FAN

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 3
System Type SINGLE ZONE AHU WITHOUT RETURN FAN

Date 13-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	3	EA	2.83	8.48	25.42	$215	99.50	$299			$514
CURRENT SWITCH	1	EA	1.83	1.83	25.42	$46	105.50	$106			$152
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	1	EA	2.83	2.83	25.42	$72	71.50	$72			$143
DUCT TEMPERATURE	1	EA	2.83	2.83	25.42	$72	120.00	$120			$192
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$477		$661			$1,138

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 3
System Type SINGLE ZONE AHU WITHOUT RETURN FAN

Date 13-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	1	1	1	1	$604
2	Economizer					
3	DDC		2		1	$534
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1	3	1	2	$1,138

TYPICAL HVAC SYSTEM NO. 4

SINGLE ZONE AHU

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 4
System Type SINGLE ZONE AHU

Date 13-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	3	EA	2.83	8.48	25.42	$215	99.50	$299			$514
CURRENT SWITCH	2	EA	1.83	3.65	25.42	$93	105.50	$211			$304
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	1	EA	2.83	2.83	25.42	$72	71.50	$72			$143
DUCT TEMPERATURE	2	EA	2.83	5.65	25.42	$144	120.00	$240			$384
AVG. TEMPERATURE	1	EA	3.33	3.33	25.42	$85	199.50	$200			$284
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$680		$1,086			$1,766

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 4
System Type SINGLE ZONE AHU

Date 13-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	1		2	1	$584
2	Economizer		1		2	$647
3	DDC		2		1	$534
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1	3	2	4	$1,766

TYPICAL HVAC SYSTEM NO. 5

SINGLE ZONE AHU WITH HUMIDIFICATION

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 5
System Type SINGLE ZONE AHU WITH HUMIDIFICATION

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	3	EA	2.83	8.48	25.42	$215	99.50	$299			$514
CURRENT SWITCH	2	EA	1.83	3.65	25.42	$93	105.50	$211			$304
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	1	EA	2.83	2.83	25.42	$72	71.50	$72			$143
DUCT TEMPERATURE	2	EA	2.83	5.65	25.42	$144	120.00	$240			$384
AVG. TEMPERATURE	1	EA	3.33	3.33	25.42	$85	199.50	$200			$284
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY	1	EA	2.33	2.33	25.42	$59	167.50	$168			$227
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$739		$1,254			$1,993

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 5
System Type SINGLE ZONE AHU WITH HUMIDIFICATION

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	1		2	2	$811
2	Economizer		1		2	$647
3	DDC		2		1	$534
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1	3	2	5	$1,993

TYPICAL HVAC SYSTEM NO. 6

MULTI-ZONE AHU

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 6
System Type MULTI-ZONE AHU

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	7	EA	2.83	19.78	25.42	$503	99.50	$697			$1,199
CURRENT SWITCH	2	EA	1.83	3.65	25.42	$93	105.50	$211			$304
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	4	EA	2.83	11.30	25.42	$287	71.50	$286			$573
DUCT TEMPERATURE	3	EA	2.83	8.48	25.42	$215	120.00	$360			$575
AVG. TEMPERATURE	1	EA	3.33	3.33	25.42	$85	199.50	$200			$284
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$1,254		$1,819			$3,073

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 6
System Type MULTI-ZONE AHU

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE DO	AO	DI	AI	TOTAL
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	1		2	2	$728
2	Economizer		1		2	$647
3	DDC		6		4	$1,698
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1	7	2	8	$3,073

TYPICAL HVAC SYSTEM NO. 7

VAV AHU

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 7
System Type VAV AHU

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID	1	EA	1.83	1.83	25.42	$46	68.50	$69			$115
E/P TRANSDUCER	4	EA	2.83	11.30	25.42	$287	99.50	$398			$685
CURRENT SWITCH	2	EA	1.83	3.65	25.42	$93	105.50	$211			$304
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	2	EA	2.83	5.65	25.42	$144	71.50	$143			$287
DUCT TEMPERATURE	2	EA	2.83	5.65	25.42	$144	120.00	$240			$384
AVG. TEMPERATURE	1	EA	3.33	3.33	25.42	$85	199.50	$200			$284
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)	1	EA	2.83	2.83	25.42	$72	229.50	$230			$301
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$942		$1,555			$2,497

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 7
System Type VAV AHU

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	2		2	2	$843
2	Economizer		1		2	$647
3	DDC		3		2	$1,007
4	Monitoring					
TOTAL THIS SHEET	TOTAL	2	4	2	6	$2,497

TYPICAL HVAC SYSTEM NO. 8

CHILLER AND PUMPS

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 8
System Type CHILLER AND PUMPS

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	2	EA	2.83	5.65	25.42	$144	65.50	$131			$275
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER		EA	2.83		25.42		99.50				
CURRENT SWITCH	2	EA	1.83	3.65	25.42	$93	105.50	$211			$304
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE		EA	2.83		25.42		71.50				
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)	2	EA	2.83	5.65	25.42	$144	140.50	$281			$425
WATER TEMPERATURE (PLUM)	2	EA	1.83	3.65	26.69	$97	40.00	$80			$177
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$477		$703			$1,180

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 8
System Type CHILLER AND PUMPS

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback	2		2		$578
4	Monitoring				2	$602
TOTAL THIS SHEET	TOTAL	2		2	2	$1,180

TYPICAL HVAC SYSTEM NO. 9

CONVERTER AND PUMPS

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 9
System Type CONVERTER AND PUMPS

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	1	EA	2.83	2.83	25.42	$72	99.50	$100			$171
CURRENT SWITCH	1	EA	1.83	1.83	25.42	$46	105.50	$106			$152
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE		EA	2.83		25.42		71.50				
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)	2	EA	2.83	5.65	25.42	$144	140.50	$281			$425
WATER TEMPERATURE (PLUM)	2	EA	1.83	3.65	26.69	$97	40.00	$80			$177
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$431		$632			$1,063

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 9
System Type CONVERTER AND PUMPS

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback	1		1		$289
4	Monitoring					
7	Hot Water Reset		1		2	$773
TOTAL THIS SHEET	TOTAL	1	1	1	2	$1,063

TYPICAL HVAC SYSTEM NO. 10

HOT WATER BOILER AND PUMPS

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 10
System Type HOT WATER BOILER AND PUMPS

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER		EA	2.83		25.42		99.50				
CURRENT SWITCH	1	EA	1.83	1.83	25.42	$46	105.50	$106			$152
STATUS RELAY	1	EA	1.83	1.83	25.42	$46	47.50	$48			$94
SPACE TEMPERATURE		EA	2.83		25.42		71.50				
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)	2	EA	2.83	5.65	25.42	$144	140.50	$281			$425
WATER TEMPERATURE (PLUM)	2	EA	1.83	3.65	26.69	$97	40.00	$80			$177
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$406		$580			$985

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 10
System Type HOT WATER BOILER AND PUMPS

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback	1		2		$383
4	Monitoring					
7	Hot Water Reset				2	$602
TOTAL THIS SHEET	TOTAL	1		2	2	$985

TYPICAL HVAC SYSTEM NO. 11

CONDENSING UNIT

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 11
System Type CONDENSING UNIT

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER		EA	2.83		25.42		99.50				
CURRENT SWITCH	1	EA	1.83	1.83	25.42	$46	105.50	$106			$152
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE		EA	2.83		25.42		71.50				
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$118		$171			$289

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 11
System Type CONDENSING UNIT

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback	1		1		$289
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1		1		$289

TYPICAL HVAC SYSTEM NO. 12

BASEBOARD RADIATION

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 12
System Type BASEBOARD RADIATION

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER	1	EA	2.83	2.83	25.42	$72	99.50	$100			$171
CURRENT SWITCH	1	EA	1.83	1.83	25.42	$46	105.50	$106			$152
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	2	EA	2.83	5.65	25.42	$144	71.50	$143			$287
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)	1	EA	2.83	2.83	25.42	$72	140.50	$141			$212
WATER TEMPERATURE (PLUM)	1	EA	1.83	1.83	26.69	$49	40.00	$40			$89
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$454		$594			$1,048

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 12
System Type BASEBOARD RADIATION

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback	1		1	2	$576
3	DDC		1		1	$472
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1	1	1	3	$1,048

TYPICAL HVAC SYSTEM NO. 13

STEAM BOILER (HUMIDIFIER)

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 13
System Type STEAM BOILER (HUMIDIFIER)

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A		EA	2.83		25.42		65.50				
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER		EA	2.83		25.42		99.50				
CURRENT SWITCH		EA	1.83		25.42		105.50				
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE		EA	2.83		25.42		71.50				
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)	1	EA	2.83	2.83	25.42	$72	229.50	$230			$301
PSI/PSIG (PLUM)	1	EA	1.83	1.83	25.42	$46	40.00	$40			$86
TOTAL THIS SHEET						$118		$270			$388

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 13
System Type STEAM BOILER (HUMIDIFIER)

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback					
3	DDC					
4	Monitoring				1	$388
TOTAL THIS SHEET	TOTAL				1	$388

TYPICAL HVAC SYSTEM NO. 14

VENTILATION UNIT

COST ESTIMATE

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 14
System Type VENTILATION UNIT

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By
Basis of Est Vendor Catalog

POINT DESCRIPTION	Quantity		Labor				Material		Equipment, Misc.		TOTAL
	No. Of Units	Unit Meas	MH/ Unit	Total Hrs	Unit Price	Cost	Unit Price	Cost	Unit Price	Cost	
CONTROL RELAY W/H-O-A	1	EA	2.83	2.83	25.42	$72	65.50	$66			$137
SOLENOID		EA	1.83		25.42		68.50				
E/P TRANSDUCER		EA	2.83		25.42		99.50				
CURRENT SWITCH	1	EA	1.83	1.83	25.42	$46	105.50	$106			$152
STATUS RELAY		EA	1.83		25.42		47.50				
SPACE TEMPERATURE	1	EA	2.83	2.83	25.42	$72	71.50	$72			$143
DUCT TEMPERATURE		EA	2.83		25.42		120.00				
AVG. TEMPERATURE		EA	3.33		25.42		199.50				
WATER TEMPERATURE (ELEC)		EA	2.83		25.42		140.50				
WATER TEMPERATURE (PLUM)		EA	1.83		26.69		40.00				
SPACE RELATIVE HUMIDITY		EA	2.33		25.42		167.50				
PSI/PSIG (ELEC)		EA	2.83		25.42		229.50				
OUTSIDE AIR TEMPERATURE		EA	2.33		25.42		132.50				
TOTAL THIS SHEET						$190		$243			$433

ESTIMATE DETAILS

Project FEASIBILITY STUDY FOR EXPANSION OF EMCS
Location FORT DRUM, NY
Bldg. No.
System No. 14
System Type VENTILATION UNIT

Date 12-Apr-95
Sheet 1 of 2
Estimator KC
Checked By

UMCS FUNCTION	UMCS APPLICATION	UMCS POINT TYPE				TOTAL
		DO	AO	DI	AI	
1	Schedule ST/SP Optimum ST/SP Duty Cycle Demand Limit Night Setback Forced Ventiltion	1		1	1	$433
2	Economizer					
3	DDC					
4	Monitoring					
TOTAL THIS SHEET	TOTAL	1		1	1	$433

APPENDIX C.4

TYPICAL HVAC SYSTEM MANUFACTURERS' CUTSHEETS

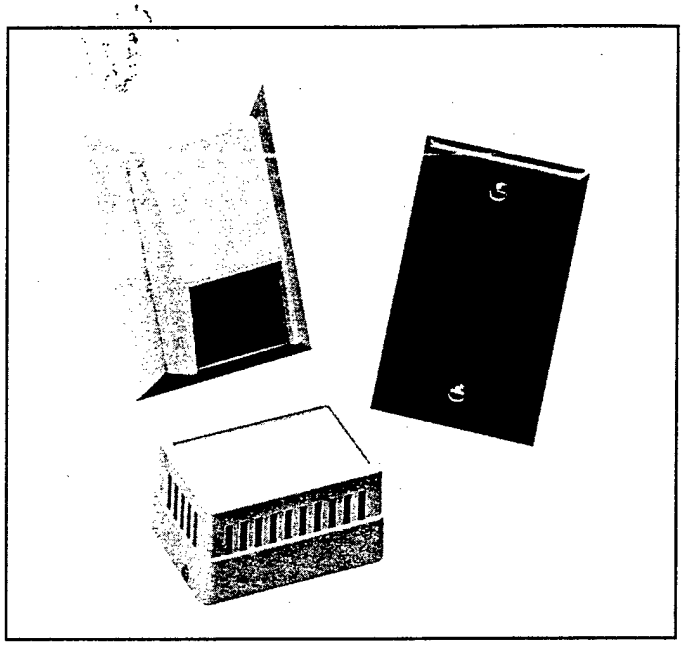
1000 OHM PLATINUM SPACE SENSORS

1

MODELS ST-S91, ST-S91E, ST-S91P

DESCRIPTION

The **Type 91 Space Temperature Sensors** provide stable, accurate room sensing for temperature control and Building Automation Systems. The room sensors feature: a stainless steel insulated plate; a standard plastic ventilated enclosure; and a deluxe executive enclosure design. The stainless steel plate is ideal for areas of vandalism or where the sensor can be easily knocked off the wall. The sensors are designed for interior use only in the temperature range of 0° to 140°F (-18° to 60°C).



SPECIFICATIONS	
Sensing element	1000 Ω thin film platinum TCR 0.00375 Ω/Ω/°C
Sensor accuracy	±0.2% of 1000 Ω at 32°F (0°C)
Ice point resistance	1000 ohms ±2 Ω (±0.2%)
Interchangeability	±0.5°C or 0.8% of temp at ±0.2% R_0 trim
Temp range	0° to 140°F (-18° to 60°C)

DUCT 74.53 X 0.5 = $37.5
WATER 115.5 X 0.5 = $58
OAT 98.5 X 0.5 = $50
TRANSMITTER 80 X 0.5 = $40

ORDERING INFORMATION

MODEL	DESCRIPTION	
ST-S91	Surface Mount 1000 Ohm Thin Film Platinum Room Sensor	
	ENCLOSURES	
	P	Plastic Ventilated Room Enclosure
	E	Executive Style Room Enclosure
	-	Stainless Steel Plate

ST-S91 **P**

Example: **ST-S91P** Surface Mount 1000 Ohm 375 Platinum Room Sensor with Plastic Ventilated Room Enclosure

Related Product

T91U **Rangeable 4-20 mA Temperature Transmitter**

1000 OHM PLATINUM RTD SENSORS

ST-A91, ST-D91, ST-O91, ST-R91S, ST-W91

DESCRIPTION

The **Type 91** temperature sensors utilize a 1000 Ω thin film platinum resistance element. These sensors provide stable, accurate measurement for temperature control and Building Automation Systems, using standard 304 stainless steel probes.

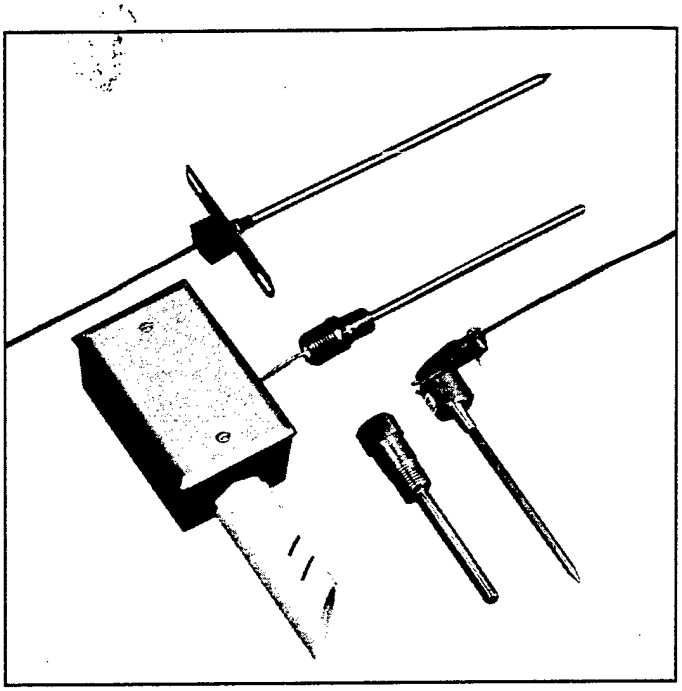
The ***Immersion Sensor*** comes with a standard brass or optional stainless steel thermowell.

The ***Duct Sensor*** has mounting tabs for direct mounting on a duct or installation in a handibox.

The ***Outdoor Sensor*** is equipped with a sun shield and weatherproof box for mounting under the eaves or some other sheltered area. It is rated for outdoor applications.

The ***Strap-on Sensor*** is suitable for direct application to pipe surfaces for chilled and hot water applications.

The ***All Purpose Sensor*** can be used in any of the above applications.



All of the above sensors are available with an optional 4-20 mA transmitter output. See the T91U Transmitter in this section of the Kele catalog.

FEATURES

- ***High accuracy***
- ***No-drift platinum***
- ***Interchangeability***
- ***Low cost***

SPECIFICATIONS

Sensing element	1000 Ω thin film platinum TCR 0.00375 Ω/Ω/°C	**Long term stability**	<0.05°C (0.2 Ω) per 5 years in air environments
Ice point resistance	1000 Ω ±2 Ω (±0.2%)	**Recommended current**	1 mA max in still air for <0.3°C (0.5°F) self-heating
Interchangeability	±0.5°C at 0.8% of temperature at ±0.2% R_0 trim		
Sensing element temp range	-67° to 302°F (-55° to 150°C)		

1

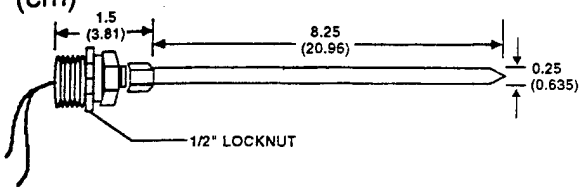
1000 OHM PLATINUM RTD SENSORS

ST-A91, ST-D91, ST-O91, ST-R91S, ST-W91

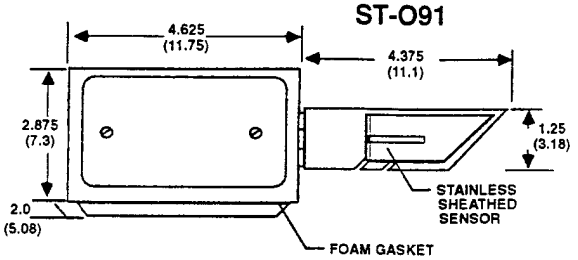
DIMENSIONS

in
(cm)

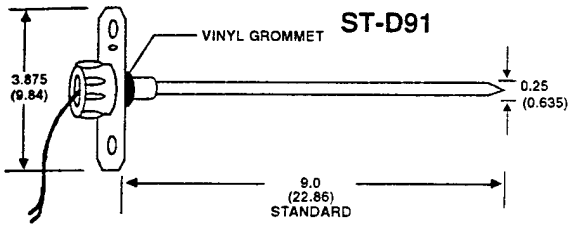
ST-A91



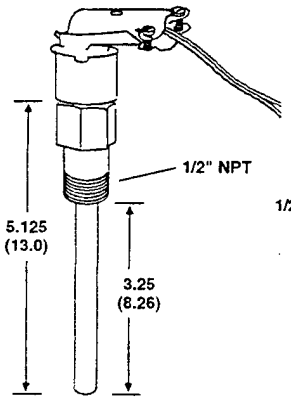
ST-O91



ST-D91

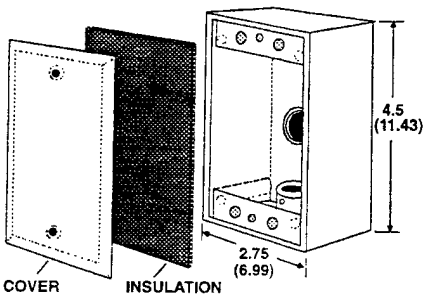


ST-W91

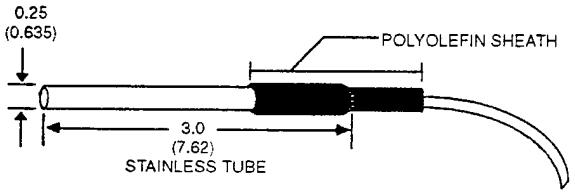


XW OPTION

1/2" NPT THREAD BACK AND BOTH ENDS



ST-R91S



ORDERING INFORMATION

MODEL	DESCRIPTION
ST-A91	All Purpose Sensor
ST-D91	Duct Sensor
ST-O91	Outdoor Air Sensor
ST-R91S	Strap-on Sensor
ST-W91	Immersion Sensor with Brass Thermowell
E	Immersion Sensor Without Well
S	Stainless Steel Thermowell for Immersion Only

OPTIONS	
XH	Handibox Housing (**ST-A91, -D91, -W91** only)
XW	Weatherproof Housing (**ST-A91,-D91,-W91** only)

ST-W91 [ ] — [XW]

Example: **ST-W91-XW** Immersion Sensor with brass well and weatherproof housing option

Related Product: T91U 4-20 mA Temperature Transmitters

1000 OHM PLATINUM RTD TRANSMITTER

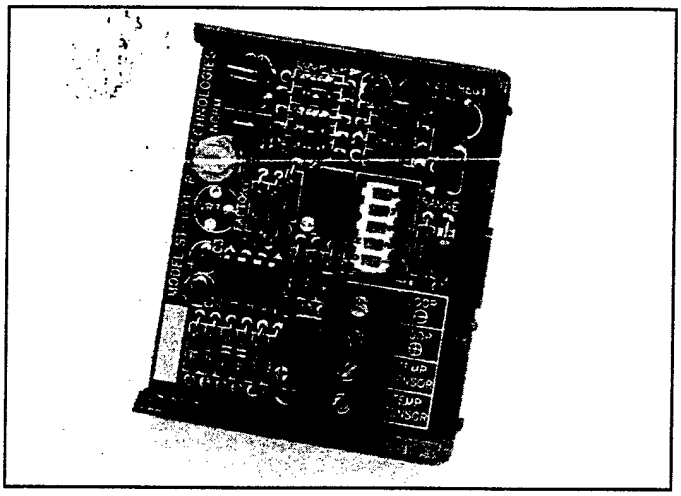
MODEL T91U

DESCRIPTION

The **T91U** is a rangeable two-wire, 4-20 mA RTD transmitter designed for use with **Type 91** 1000 Ω Platinum RTD Sensors. The transmitter is available in three standard ranges, or can be set for any range between -30° to 250°F (-34° to 121°C) with a minimum span of 40°F (22°C).

To range the **T91U**, set the DIP switches to match your selected range and use the zero and span pots to fine tune your adjustment. (High accuracy digital ohmmeter and decade box required.)

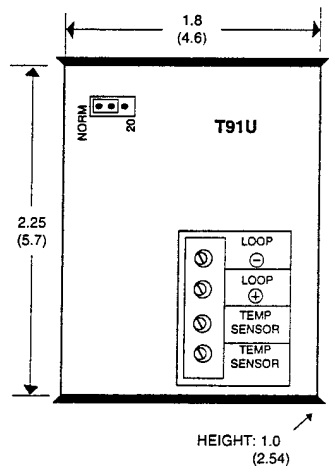
The **T91U** has a special 20 mA loop calibration test signal to provide easy system verification. Simply move the bottle plug jumper from NORM to 20 and the transmitter will output a constant 20 mA. The Loop Up LED provides power indication for the 4-20 mA output.



FEATURES

- ***Switch-set rangeable***
- ***Loop calibration test signal***
- ***Low cost***
- ***Snap-track mounting***
- ***Loop power LED indication***

DIMENSIONS



SPECIFICATIONS

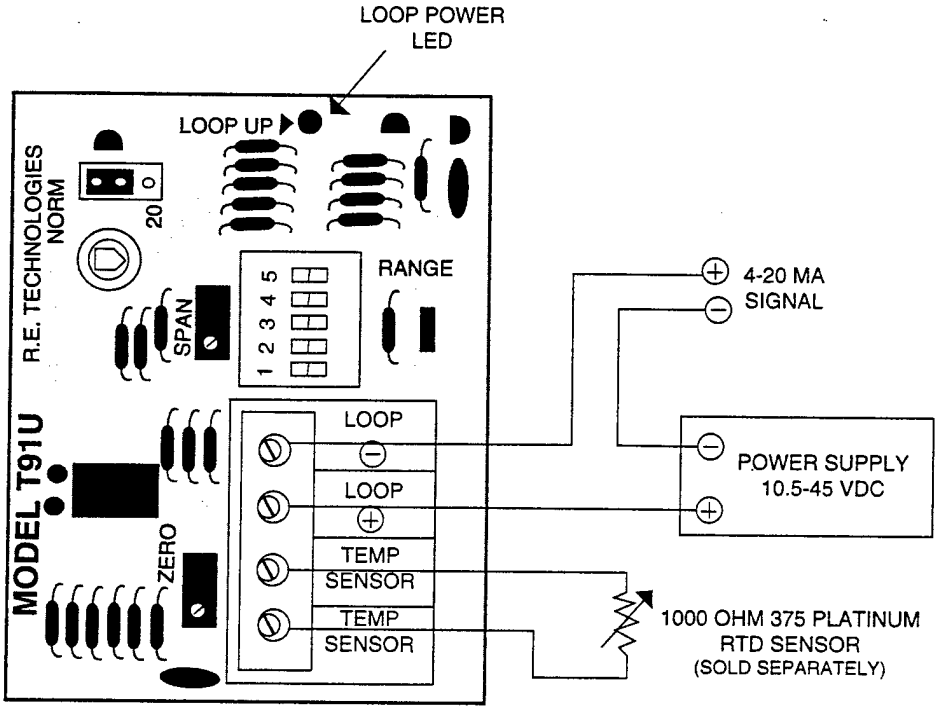
Sensor input	1000 Ω thin film platinum TCR 0.00375 Ω/Ω/°C	**Max impedance**	250 Ω at 15.5 VDC 500 Ω at 20.5 VDC 675 Ω at 24 VDC
Configuration	Two-wire, loop-powered	**Ambient temp**	0° to 140°F (-18° to 60°C)
Rangeability	-30° to 250°F (-34° to 121°C) Minimum span of 40°F (22°C)	**Humidity**	0-95% noncondensing
Output	4-20 mA	**Temp effect**	0.015% span/°F
Output limit	25 mA (sensor leads open)	**Accuracy**	0.1°F or 0.2% of span
Loop calibration output	20 mA ±0.1%	**RTD current**	0.65 mA
Supply voltage	10.5 VDC-45 VDC	**Dimensions**	1.8"W x 2.25"L x 1"H (4.6 cm x 5.7 cm x 2.5 cm)

1

1000 OHM PLATINUM RTD TRANSMITTER

MODEL T91U

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION
T91U	4-20 mA Rangeable RTD Transmitter
	RANGE
	2 -20° to 140°F (-29° to 60°C)
	3 0° to 100°F (-18° to 38°C)
	4 30° to 240°F (-1° to 116°C)
	XK Special range
	SENSOR TYPE
	— Transmitter only
	D **ST-D91-XW** Duct Sensor (premounted and wired)
	O **ST-O91** Outside Air Sensor (premounted and wired)
	W **ST-W91-XW** Immersion Sensor (premounted and wired)

T91U — 2 — D

Example: **T91U-2-D** Transmitter with range of -20° to 140°F (-29° to 60°C) premounted and wired in duct sensor enclosure

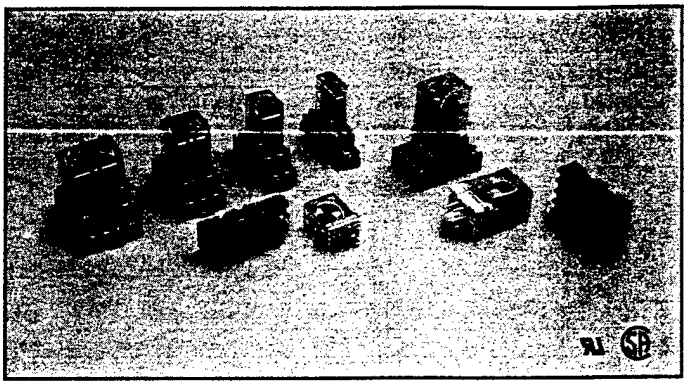
RELAY SPDT 14.75 X 0.5 = 7.5
BASE 8.22 X 0.36 = 3

RELAYS

RH / RR / RHN SERIES

DESCRIPTION

IDEC Relays are available in the **RH Series Midget Power Relays**, the **RR Series Heavy Duty General Purpose Relays,** and the **RHN Low Amperage Midget Relays.** The **RH Series Midget Power Relays** are compact in size to reduce space requirements and have a full 10 amp switching capacity. **RH Series Relays** are available in SPDT, DPDT, 3PDT, and 4PDT contact configurations driven by AC or DC coils. **RH Series Relays** have blade mount terminals and the SPDT, 3PDT and 4PDT are available with top bracket mounting. The DPDT is available as a latching relay.



The **RR Series Heavy Duty General Purpose Relays** have a 10 amp contact rating and are characterized by their high reliability and long life. They are suited for use in industrial grade equipment, control equipment, communications, etc. **IDEC RR Series Relays** are available in DPDT and 3PDT configurations driven by AC or DC coils. **RR Series Relays** have pin type terminals.

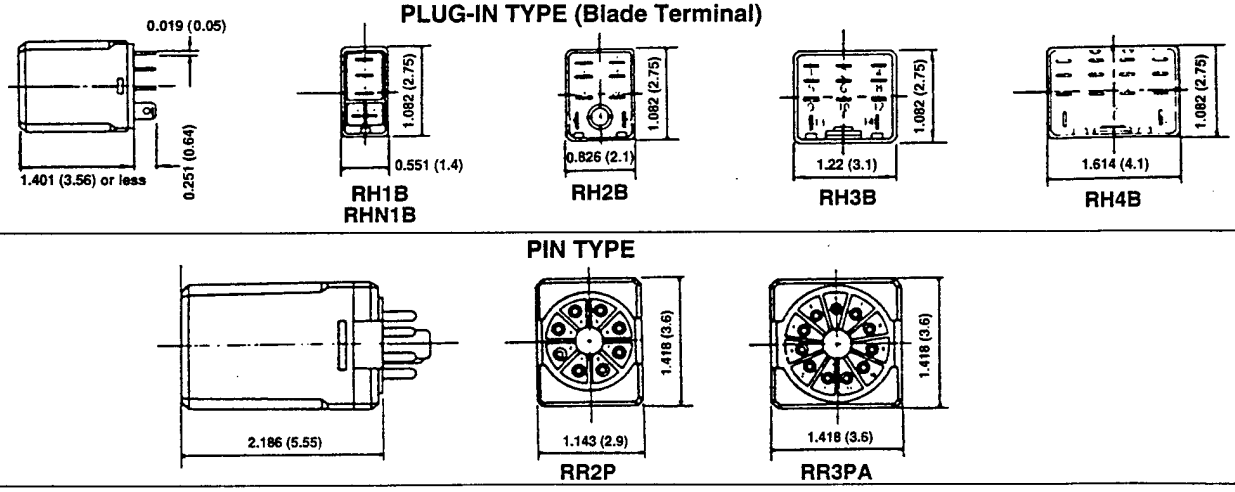
The **RHN Series** features a lower amperage coil and silver contacts. These are available in a SPDT blade configuration.

FEATURES

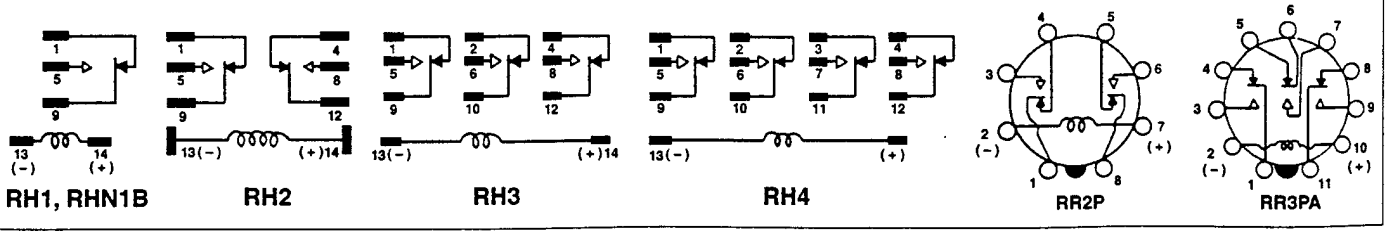
- ***General purpose and midget sizes available***
- ***10 amp contact rating (5 amp available on RHN)***
- ***UL recognized and CSA certified***
- ***Indicator light or check button available on 2, 3, and 4-pole models***
- ***Complete line of accessories for flexible application***

DIMENSIONS

in (cm)



CIRCUIT DIAGRAMS



14

RELAYS

RH / RR / RHN SERIES

RATINGS

COIL RATING RH SERIES

Rated Voltage (V)		Rated Current (mA) ±15% at 20°C 60 Hz SPDT	DPDT	3PDT	4PDT	50 Hz SPDT	DPDT	3PDT	4PDT	Coil Resistance (Ω) ±15% at 20°C SPDT	DPDT	3PDT	4PDT
AC	6	150	200	280	330	170	238	330	387	18.8	9.4	6.0	5.4
	12	75	100	140	165	86	118	165	196	76.8	39.3	25.3	21.2
	24	37	50	70	83	42	59.7	81	98	300	153	103	84.5
	120	7.5	11	14.2	16.5	8.6	12.9	16.4	19.5	7680	4170	2770	2220
	*240	—	5.5	7.1	8.3	—	6.5	8.2	9.8	—	15210	12100	9120
		SPDT	DPDT	3PDT	4PDT					SPDT	DPDT	3PDT	4PDT
DC	6	128	150	240	250					47	40	25	24
	12	64	75	120	125					188	160	100	96
	24	32	36.9	60	62					750	650	400	388

UL & CSA HORSEPOWER RATINGS RH SERIES

MOTOR LOAD	SPDT, DPDT	3PDT
240 VAC	1/3 HP	1/3 HP
120 VAC	1/6 HP	1/6 HP

COIL RATINGS RR SERIES

Rated Voltage (V)		Rated Current (mA) ± 15% @ 20°C 60 Hz	50 Hz	Coil Resistance (Ω) ± 10% @ 20°C
AC	6	420	490	4.9
	12	210	245	18
	24	105	121	79
	120	20.5	24	2,100
	240	10.5	12.1	8,330
DC	6	240		25
	12	120		100
	24	60		400

COIL RATINGS RHN SERIES

Voltage (VDC)	Rated Current (mA) ± 15% @ 20°C 5A	10A	Coil Resistance (Ω) ± 10% @ 20°C 5A	10A
6	50	83.3	120	72
12	25	41.7	480	288
24	12.5	20.8	1920	1150

Note: Maximum continuous applied voltage (AC/DC)@20°C: 110% of rated voltage.
Minimum operate voltage (AC/DC)@20°C: 80% of rated voltage.
Drop-out voltage (AC) @20°C: 30% of rated voltage.
Drop-out voltage (DC) @20°C: 15% of rated voltage.

CONTACT RATING RH SERIES - UL RATINGS

VOLTAGE (V)	RESISTIVE (A) SPDT	DPDT	3PDT	4PDT	GENERAL USE(A) SPDT	DPDT	3PDT	4PDT
240 AC	10	10	—	7.5	7	7	·	5
120 AC	10	10	10	10	7.5	—	—	7.5
30 DC	10	10	10	—	7	7	—	—
28 DC	10	10	10	10	7.5	—	—	7.5

Note:*6.5A/Pole, 20A Total

CONTACT RATING RR SERIES

UL RATINGS VOLTAGE	RESISTIVE(A)	GEN.USE(A)	MOTOR LOAD
240 AC	10	7	1/3 hp
120 AC	10	7.5	1/4 hp
30 DC	10	7	—

CONTACT RATINGS RHN SERIES

	RHN1B-5U		RHN1B-10U	
LOAD	RESISTIVE	INDUCTIVE	RESISTIVE	INDUCTIVE
MAXIMUM RATED LOAD	AC: 120V/5A DC: 24V/5A	AC: 120V/3.5A DC: 24V/2.5A	AC: 120V/10A DC: 24V/10A	AC: 120V/7.5A DC: 24V/5A
MAXIMUM OPERATION RATING	AC:550VA DC:120W	AC:385 VA DC:60W	AC: 1100 VA DC:240W	AC:825VA DC:120W
MAX LOAD CURRENT	5A		10A	
MAX LOAD VOLTAGE	AC:250V DC:125V		AC:250V DC:125V	

ORDERING INFORMATION

TYPE	CONTACT CONFIGURATION	BASIC MODEL	W/INDICATOR LIGHT	W/CHECK BUTTON	W/IND. LIGHT & CHECK BUTTON	TOP BRACKET MOUNT TYPE	LATCHING
MIDGET	SPDT	RHN1B-5U*	—	—	—	—	—
	SPDT	RHN1B-10U*	—	—	—	—	—
	SPDT	RH1B-U	—	—	—	RH1B-UT	—
	DPDT	RH2B-U	RH2B-UL	RH2B-UC	RH2B-ULC	RH2B-UT	RH2LB-U
	3PDT	RH3B-U	RH3B-UL	RH3B-UC	RH3B-ULC	—	—
	4PDT	RH4B-U	RH4B-UL	RH4B-UC	—	RH4B-UT	—
GENERAL PURPOSE	DPDT	RR2P-U	RR2P-UL	—	—	—	—
	3PDT		RR3PA-U	RR3P-UL	—	—	—

	AC	DC
AVAILABLE COILS	24V	6V
	120V	12V
	240V	24V

*AVAILABLE IN DC ONLY

Related Products
Sockets
BAM-1000 or DIN-3F Mounting Track

To Order: Select the basic model from the table, indicate AC or DC and the voltage. Example: **RH2B-UAC24V** - DPDT Midget Relay with 24 VAC coil.

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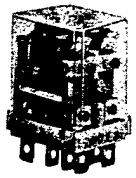
RELAY SELECTION GUIDE

RR / RH / RHN SERIES

RELAY SELECTION GUIDE

	Series	Contact				Coil	
		Terminal Style	Configuration	Material	Resistive	Rated Voltage	Power Consumption
	RR Series Power Relays	• Pin/Octal	• SPDT • DPDT • 3PDT	Silver	10A, 120 VAC, 240 VAC 10A, 30 VDC 1/3 hp, 240 VAC 1/4 hp, 120 VAC	AC: 6, 12, 24, 120, 240V DC: 6, 12, 24, 48, 110V	AC: 2.5 VA DC: 1.5W
	RH Series Midget Relays	• Blade/Plug-in	• SPDT • DPDT • 3PDT • 4PDT	Silver-Cadmium Oxide	10A, 120 VAC 240 VAC 10A, 30 VDC 1/3 hp, 240 VAC 1/6 hp, 120 VAC	AC: 6, 12, 24, 120, 240V DC: 6, 12, 24 48, 110V	• SPDT AC: 1.1 VA DC: 0.8W • DPDT AC: 1.4 VA DC: 0.9W • 3PDT AC: 2 VA DC: 1.7W • 4PDT AC: 2.5 VA DC: 1.5W
	RHN Series Low Current Relays	• Blade/Plug-in	• SPDT	Silver	10 amp Model 7.5A, 240 VAC 10A, 120 VAC 10A, 30 VDC 1/3 hp, 240 VAC 1/6 hp, 120 VAC	DC: 6, 12 24, 48V	• 0.3W (5A) • 0.5W (10A)
	RR2KP Series Latch Relays	• Pin/Octal	DPDT	Silver	10A, 120 VAC 10A, 30 VDC	AC: 6, 12, 24, 120, 240V DC: 6, 12, 24, 48, 110V	AC: 2.2 VA DC: 1.5W

ORDERING INFORMATION

RR | 2 | | P | – | | U | DC24V

1. **RELAY SERIES**
   RR, RH, RHN

2. **CONTACT CONFIGURATION**
   1.....Single Pole Double Throw (SPDT)
   2.....Double Pole Double Throw (DPDT)
   3.....Three Pole Double Throw (3PDT)
   4.....Four Pole Double Throw (4PDT)

3. **SYMBOL TO DESIGNATE LATCH RELAY**
   K.....Self-Retaining Magnetic Type (RR Series)
   L .....Self-Retaining Magnetic Type (RH Series)

4. **TERMINAL STYLE**
   P/PA.....Pin / Octal
   B/BA .....Blade / Plug-in

5. **CURRENT RATING**
   (**RHN** STYLE ONLY)
   5.....5 amp
   10.....10 amp

6. **RATINGS / ACCESSORIES**
   U.....UL / CSA
   UT.....Top Bracket Mounting
   UL.....Equipped with Indicator Light
   UC .....Equipped with Check Button
   ULC ...Indicator Light & Check Button

7. **COIL VOLTAGE**

Example: RR2P - UDC24V - DPDT Power Relay with Pin Terminals and 24 VDC Coil

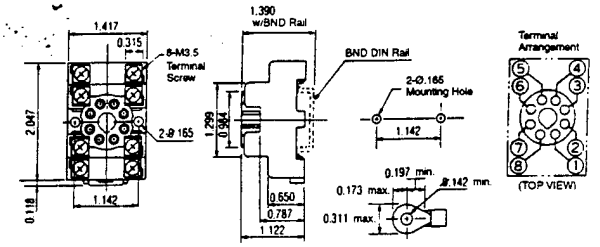
KELE & ASSOCIATES • P O Box 34817 • Memphis, TN 38184 • 901-382-4300 • FAX 901-372-2531

HEAVY DUTY - GENERAL PURPOSE SOCKETS

SR SERIES / SNAP-MOUNT

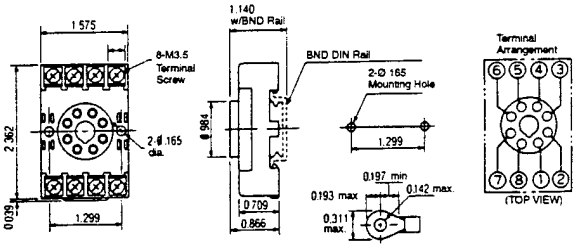
SR2P-05

Type: 8-pin octal, snap-mount/surface-mount
Terminal: M3.5 screws w/captive wire clamp
Wire Size: Max up to 2-#12 AWG
Electrical Rating: 300V, 10A
Relay No.: RR2P
Timer No.: RTE-P1
Hold-Down Spring: SR2B-02F1
Hold-Down Clip: SFA-203



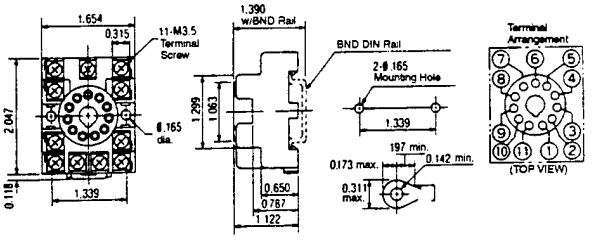
SR2P-06

Type: 8-pin, snap-mount/surface-mount
Terminal: M3.5 screws w/captive wire clamp
Wire Size: Max up to 2-#12 AWG
Electrical Rating: 300V, 10A
Relay No.: RR2P
Timer No.: RTE-P1
Hold-Down Spring: SR2B-02F1
Hold-Down Clip: SFA-202



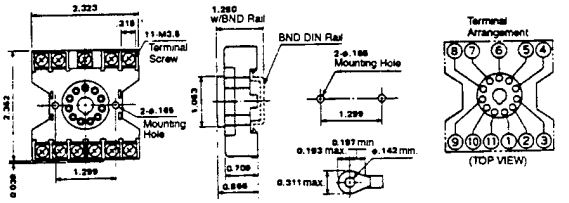
SR3P-05

Type: 11-pin octal, snap-mount/surface-mount
Terminal: M3.5 screws w/captive wire clamp
Wire Size: Max up to 2-#12 AWG
Electrical Rating: 300V, 10A
Relay No.: RR3PA, RR2KP*
Timer No.: RTE-P2
Hold-Down Spring: SR3B-02F1, SR3P-06F3**
Hold-Down Clip: SFA-203
*Latching type relay **For RR2KP relay



SR3P-06

Type: 11-pin octal, snap-mount/surface-mount
Terminal: M3.5 screws w/captive wire clamp
Wire Size: Max up to 2-#12 AWG
Electrical Rating: 300V, 10A
Relay No.: RR3PA, RR2KP *
Timer No.: RTE-P2
Hold-Down Spring: SR3B-02F1, SR3P-06F3**
Hold-Down Clip: SFA-202
*Latching type relay **For RR2KP relay



Dimensions indicated in inches

NOTE: For Touch-Safe Sockets, add C to the end of the catalog number.

35 X 0.5 = 17.5

SELECTOR SWITCHES

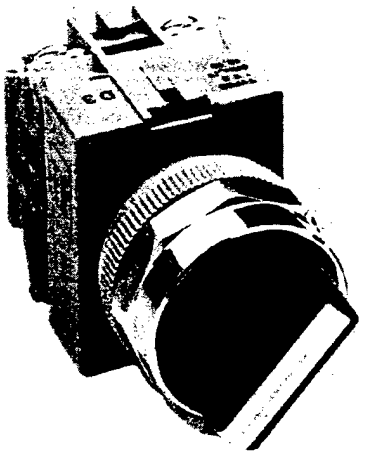
ASW SERIES

DESCRIPTION

General purpose selector switches for pilot duty control of electrical equipment.

FEATURES

- ***Snap-fit block comes in N.O. and N.C. contacts***
- ***Contacts are self-cleaning***
- ***Operator base made of durable nylon***
- ***Switches are UL listed - file #E70646 and CSA Certified - file #LR48366***



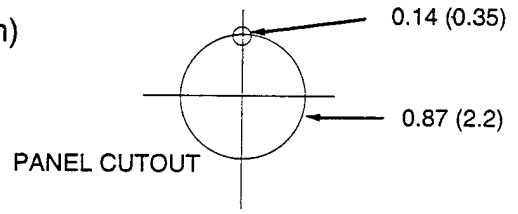
KNOB TYPE SELECTOR SWITCH

SPECIFICATIONS

Contact resistance	50 MΩ maximum (initial valve)
Insulation resistance	100 MΩ minimum between live and dead parts
Mechanical life	500,000 minimum operations
Electrical life	500,000 minimum operations
Contact rating	10 amps 600 VAC, VDC
Terminals	#6-40 (M3.5) screws (Terminal tab adaptor and wire wrap terminal available)

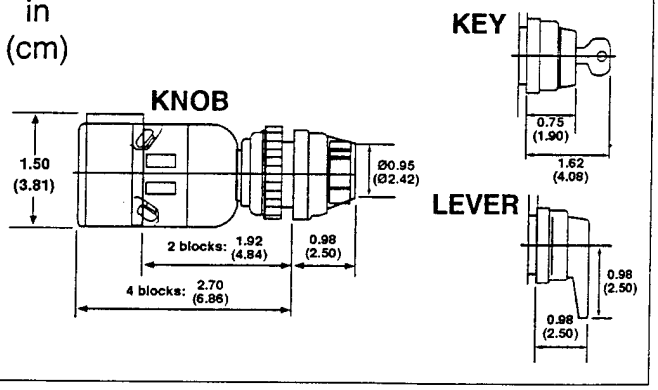
INSTALLATION

in
(cm)



DIMENSIONS

in
(cm)



ORDERING INFORMATION

Assembled Selector Switches		
	1 N.O. Contact 2 Position (Off-On)	2 N.O. Contacts 3 Position (On-Off-On)
Knob Type	ASW210	ASW320
Lever Type	ASW2L10	ASW3L20
Key Type	ASW2K10	ASW3K20
Legend Plate	NWAL (212) – Off-On	NWAL (317) – Hand-Off-Auto

Call Kele & Associates for selector switches with other contact arrangements and for other legend plates.

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PLATINUM CURVE AVERAGING SENSORS 234X0.5=$117

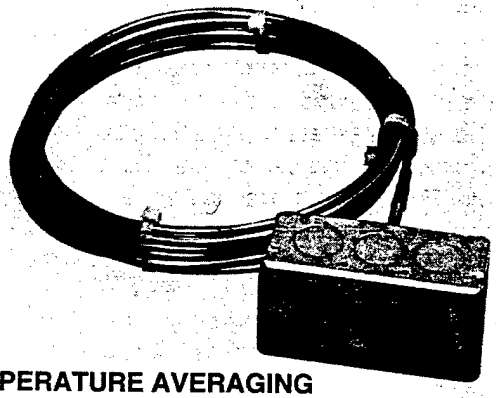
MODEL ST-AV91

DESCRIPTION

Bendable Area Averaging Sensors
These continuous resistance element **Averaging Sensors** provide accurate sensing of duct temperatures when a large area must be covered. They average temperatures over their entire lengths thus avoiding point measurement errors.

The **Averaging Sensors** use an element that closely matches platinum resistance/temperature characteristics over the specified range of -30° to 240°F (-34° to 116°C).

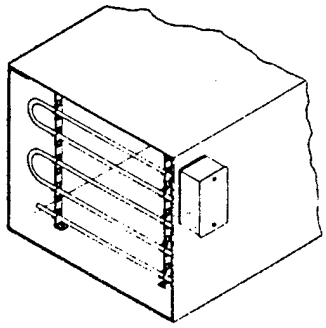
The sensors have a copper case which is bendable to a radius of 4". They can crisscross a duct or plenum to average out temperature stratification in both directions.



TEMPERATURE AVERAGING SENSOR

SPECIFICATIONS

Sensor	1000 ohms @ ±0.25% at 32°F (0°C) TCR 0.00375 Ω/Ω/°C
Probe material	Copper
Length	20 ft (6.1 meters)
Temp range	-30° to 240°F (-34° to 116°C)



TYPICAL APPLICATION

ORDERING INFORMATION

ST-AV91	Averaging Duct Sensor 1000 ohm 375 platinum, 20 ft long
	Related Product
T91U	Rangeable 4-20 mA Temperature Transmitter

80X0.5=40
TOTAL $157

E M C ENGINEERS, INC.
2750 S. Wadsworth Blvd. Suite C-200 Denver, CO 80227 (303) 988-2951
9755 Dogwood Rd. Suite 220 Roswell, GA 30075 (404) 642-1864

JOB 1406-006
SHEET NO. _____ OF _____
CALCULATED BY VC DATE 4/4/95
CHECKED BY _____ DATE _____
SCALE _____

LABOR RATE CALCULATIONS

ELECTRICIAN $28.50/HR (BASE RATES)

PLUMBER $29.30/HR (BASE RATES)

LOCATION SYRACUSE NY.

MECHANICAL 91.1%

ELECTRICAL 89.2%

THEREFORE:

ELEC $28.50 X 89.2% = $25.42 /HR

PLUMBER $29.30 X 91.1% = $26.69 /HR

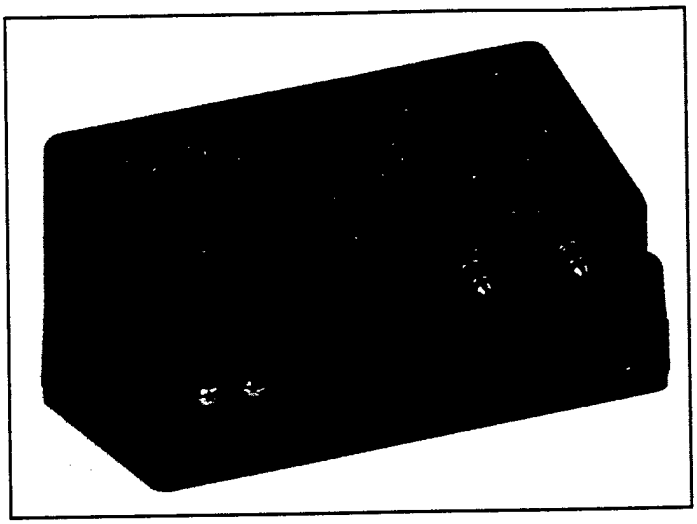
DIFFERENTIAL PRESSURE TRANSMITTER (DC Powered)

MODEL T30

DESCRIPTION

The **Modus T30** is a two-wire **Pressure Transmitter** with a 4-20 mA output. It operates on the capacitance principle and is capable of sensing very low positive, negative or differential pressures. In the capacitance cell, a very lightweight, responsive diaphragm deflects a small amount when pressure is applied. This deflection creates a change in capacitance which is then detected and processed electronically. Reliability and long life are inherent advantages of the solid-state design. A wide selection of standard pressure ranges is available.

373.61 x .50 = $186.80



FEATURES

- ***Virtually position insensitive, even at very low pressure (0.01" W.C.) (0.025mbar)***
- ***No moving parts to wear out***
- ***Compact size***
- ***Fast response time due to low internal volume***
- ***Solid-state circuitry for long life***
- ***Low power consumption***

APPLICATION

- ***Medical and analytical instruments***
- ***Leak detection***
- ***HVAC monitoring of:***
  - ***Filter differential pressures***
  - ***Fan static pressures***
  - ***Clean room pressures***
  - ***Variable air volume systems***
  - ***Velocity pressures***

SPECIFICATIONS

GENERAL	
Accuracy	±1% of range (including non-linearity and hysteresis)
Zero and span adjustments	Non-interactive adjustments are by means of 20-turn potentiometers for fine resolution.
ELECTRICAL	
Operating voltage	10 to 35VDC (See diagram on reverse side for maximum loop resistance). Protected against reversal of polarity.
Output	Limited to approx. 3.85 mA at low end of span and approx. 26 mA at upper end of span.
PRESSURE	
Ranges	See Ordering Information
Measures	Differential, gauge pressure or vacuum. Suitable for air or inert gases.
Maximum safe momentary overpressure	8 times pressure range
Port connections	3/16" Dia.suitable for: 1/8" or 5/32" ID **Tygon**™or polyurethane tubing; 1/4" OD polyethylene tubing. Integral filters at both ports.
PHYSICAL	
Dimensions	3.00"W x 5.15"L x 1.40"H (7.62 cm x 13.1 cm x 3.5 cm)
Weight	0.42 lb (190 g)
Case	Flame retardant, glass reinforced NORYL ™
ENVIRONMENTAL	
Operating temp range	32° to 125°F (0° to 52°C)
Storage temp	-20° to 160°F (-30° to 70°C)
Effect of temp	±0.05%/°C
Operating humidity range	20% to 90% RH noncondensing
Shock resistance	10 g (11 ms)
Vibration resistance	5 g to 50 Hz

5% ROOM HUMIDITY TRANSMITTER

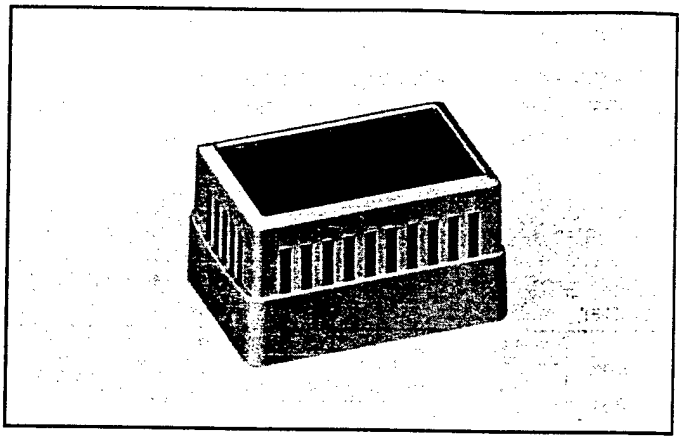
249.61 X 0.5 = $125

MODEL LCH-R

2

DESCRIPTION

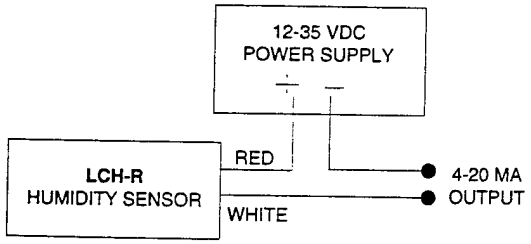
The **LCH-R** is a low cost **General Purpose Wall Mount Room Humidity Transmitter** that utilizes capacitance technology. Its wide range and good accuracy make it an ideal humidity transmitter for locations where ±5% relative humidity readings are required. The sensor is designed for indoor applications where relatively stable temperature conditions exist. The sensor should not be exposed to vapors such as acetone that attack plastics.



FEATURES

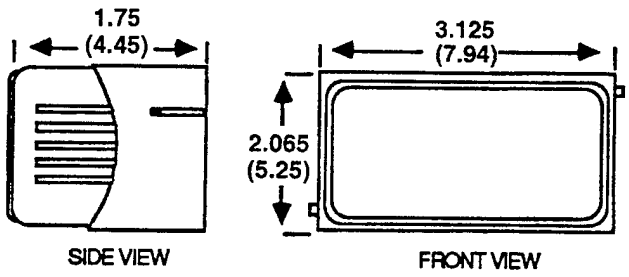
- ***Fast response***
- ***Accuracy ±5%***
- ***Humidity span 10 to 90%***
- ***Other output signals available***
- ***Highly stable***
- ***One-year warranty***

WIRING



DIMENSIONS

in
(cm)



SPECIFICATIONS

Range	0-100%
Accuracy	±5% (10-90% RH)
Linearity	±3%
Hysteresis	< 3% (10 to 90% RH)
Temp dependence	0.2% RH per degree C
Response time (no filter)	10 seconds going from 90% to 10% RH
Operating temp	-4° to 140°F (-20° to 60°C), 0 to 100% RH, noncondensing
Storage temp	21° to 158°F (-20° to 70°C), 0 to 100% RH, noncondensing
Transmitter output	4-20 mA DC two-wire, (0-100%)
Power requirement	Standard 12-35 VDC
RFI susceptibility	Good RFI rejection to normal operating conditions
Max external load with standard DC power 4-20 mA unit	250 ohms ±0.1% @ 12 VDC loop voltage, 500 ohms ±0.1% 24 VDC loop voltage
Input voltage effect	±0.005% RH/volt from 8.7V to 45V

ORDERING INFORMATION

LCH-R	**RH Space Humidity Transmitter, 4-20 mA output**

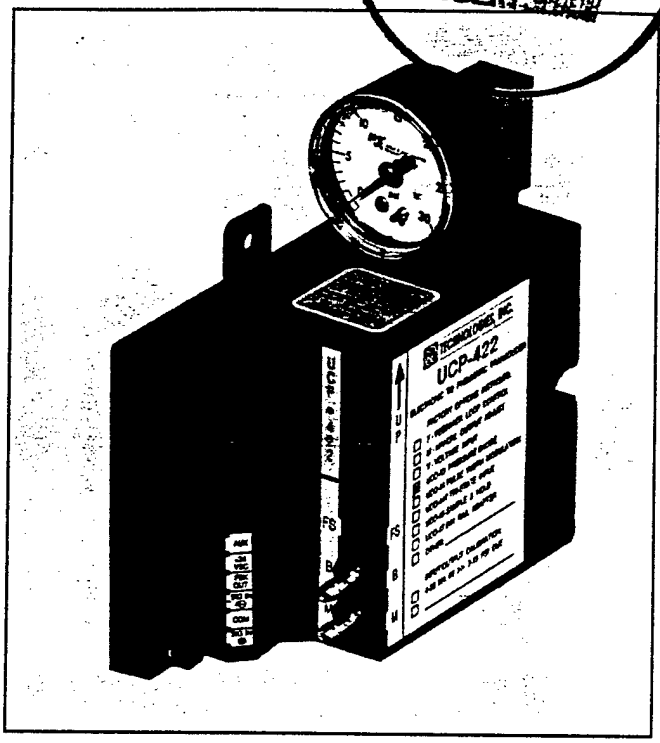
Other outputs available upon request (nonstock).

KELE ASSOCIATES™

50+ PRODUCT OF THE MONTH

SPECIAL SAVINGS!
Loop Powered Pneumatic Transducer

UCP-422 Transducer Requires Less Space and Offers Greater Flexibility and Expandability



UCP-422 Universal Electronic / Pneumatic Transducers provide low cost pneumatic control of valves, dampers or other pneumatic devices. The **UCP-422** is a totally enclosed transducer with provisions for optional DIN rail mounting or surface mounting in two planes. When DIN rail mounting is used, this compact controller requires only 2"W x 4"H mounting area, providing efficient use of panel space.

The **UCP-422** accepts a 4-20 mA signal and outputs 3-15 psig (0.207-1.03 bar). Used in its base configuration, it requires no power supply for controlling pneumatic devices.

FEATURES

- *Low cost*
- *"Slim-line" mounting (saves panel space)*
- *Quick-disconnect terminals*
- *Loop-powered control (standard)*
- *No external filter required*
- *Excellent linearity*
- *High air capacity*
- *No calibration required*

OPTIONS

- *DIN rail mounting*
- *Pressure gauge*
- *PWM input*
- *Tri-state input*
- *Feedback*
- *Failsafe*
- *Manual-output adjustment*

ANY QUANTITY CAN BE PURCHASED AT THE 50+ PRICE SHOWN BELOW

		DEALER				
MODEL	DESCRIPTION	LIST	1-5	6-24	25-49	50+
UCP-422	4-20 mA to 3-15 PSI Pneumatic Output Transducer	175.00	63.00	61.00	59.00	**57.00**
OPTIONS						
UCO-42	Failsafe	116.11	41.80	39.50	38.00	**37.00**
UCO-43	Pressure Gauge	27.50	9.90	9.40	8.90	**8.65**
UCO-44	Pulse Width Input	150.00	54.00	50.00	49.00	**48.00**
UCO-44T	Tri-State Input	194.45	70.00	68.00	66.00	**64.00**
UCO-47	DIN Rail Mounting Adapter	6.11	2.20	2.20	2.20	**1.95**
"F" Option	Feedback	163.89	59.00	58.00	57.00	**55.00**
"M" Option	Manual Override	30.56	11.00	10.00	9.00	**8.50**
"V" Option	Voltage Input	36.11	13.00	12.00	11.50	**10.50**

PRICES GOOD THROUGH 3/15/95

KELE & ASSOCIATES • P O Box 34817 • Memphis, TN 38184 • 901-382-4300 • FAX 1-800-284-5353

1000 OHM PLATINUM ROOM TEMPERATURE TRANSMITTER

58x0.5=$29

MODEL ST-T91E

DESCRIPTION

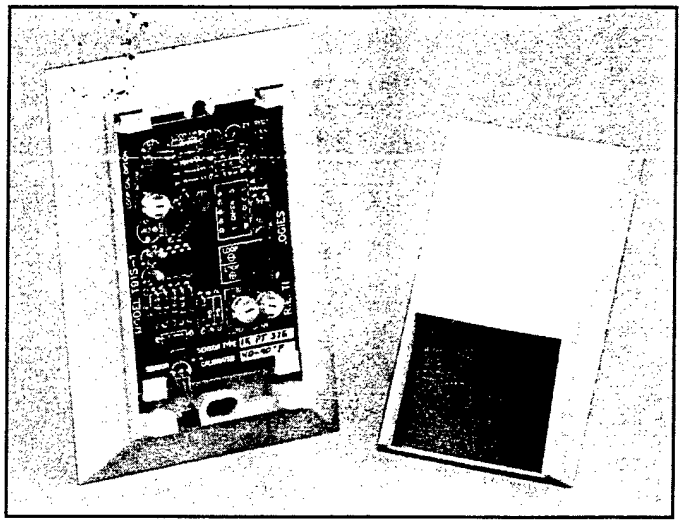
The **ST-T91E 1000 Ω Room Temperature Transmitter** provides stable, accurate room sensing for temperature control and Building Automation Systems.

The vented housing is made of a durable plastic with a tan enameled aluminum faceplate. This attractive enclosure mounts easily.

The **ST-T91E** has a loop-powered 4-20 mA output. The standard temperature range is 40° to 90°F (4° to 32°C), although other ranges are available upon request.

A special 20 mA loop calibration test signal provides easy system verification. Simply move the bottle plug jumper from NORM to 20 and the transmitter will output a constant 20 mA. The Loop Up LED provides power indication for the 4-20 mA output.

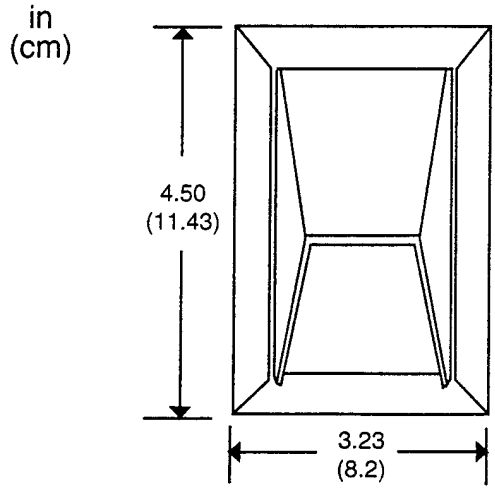
Override option: The **XME Option** is a normally open membrane momentary switch typically used to provide an override signal back to the controller input. When this switch is made, the 4-20 mA output signal goes to 3 mA until released.



FEATURES

- ***High accuracy***
- ***No-drift platinum***
- ***Loop calibration test signal***
- ***Low cost***
- ***Decorative enclosure***
- ***Loop power LED indication***
- ***Membrane override switch (optional)***

DIMENSIONS



SPECIFICATIONS

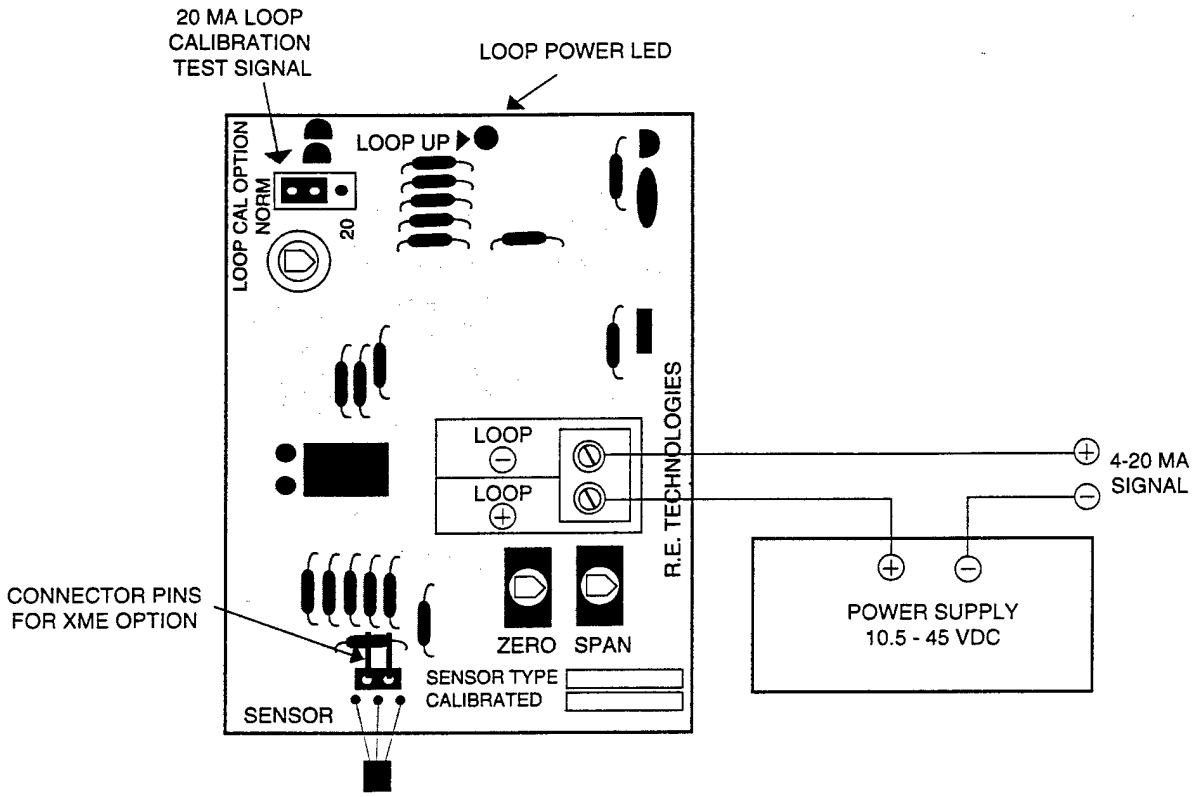
Sensing element	1000 Ω thin film platinum TCR 0.00375 Ω/Ω/°C	**Supply voltage**	10.5 VDC - 45 VDC
Ice point resistance	1000 ±2 Ω (±0.2%)	**Max impedance**	250 Ω at 15.5 VDC 500 Ω at 20.5 VDC 675 Ω at 24 VDC
Interchangeability	±0.5°C or 0.8% of temp at ±0.2% R_0 trim	**Temp operating range**	0° to 140°F (-18° to 60°C)
Configuration	Two-wire, loop-powered	**Temp effect**	0.015% span/°F
Output	4-20 mA	**Humidity**	0-95% noncondensing
Output limit	25 mA (sensor leads open)	**Transmitter accuracy**	0.2% of span
Loop calibration output	20 mA ±0.1%	**Sensor accuracy**	±0.2% of 1000 Ω at 0°C

1

1000 OHM PLATINUM ROOM TEMPERATURE TRANSMITTER

MODEL ST-T91E

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION
ST-T91E	4-20 mA Room Temperature Transmitter with 1000 ohm platinum RTD

OPTIONS	
XGR	Gray Decorator Faceplate
XK	Customization (special range, logo, or feature)
XME	Membrane Override Switch (tan faceplate standard)

Example: **ST-T91E-XME** (40° to 90°F, 4° to 32°C) Temperature Transmitter with Membrane Override Switch

ST-T91E — XME

CURRENT OPERATED SWITCHES

189 x 0.36 = $68

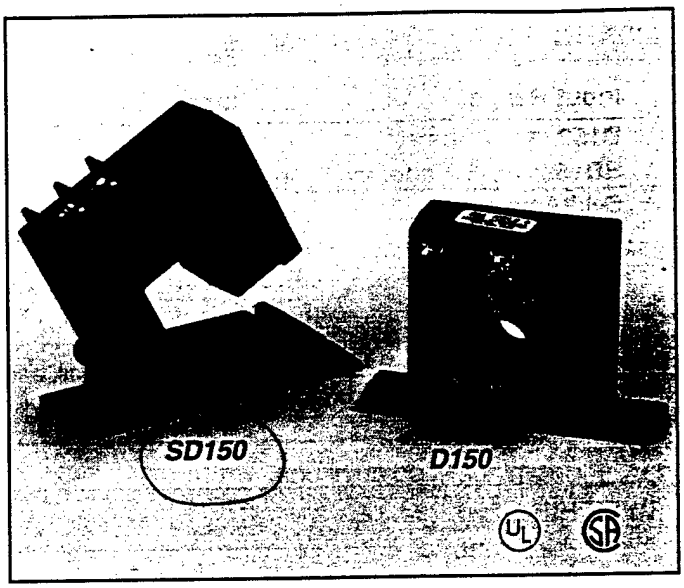
D150 / SD150 SERIES

USE THIS DEVICE TO MONITOR AC CURRENTS AND TO SWITCH DC CIRCUITS

DESCRIPTION

The **D150** or **SD150** is a **Solid-state DC Switch** which operates when the current level sensed by the internal current transformer exceeds the threshold values set by the four-turn adjustment. Three selectable ranges offer optimum adjustability and resolution. Internal circuits are totally powered by induction from the line being monitored. The **SD150** split-style allows easier installation over existing cables. The new, SMART LED with no off-state leakage current is standard on the **SD150.**

The **D150 / SD150** is recommended for relatively fixed loads where reliable ON/OFF indication or control is needed at lowest cost. See the **Model PD75** for monitoring loads which may vary slowly about the setpoint and where high-speed precision switching is required.



FEATURES

- ***Self-powered***
- ***Small size***
- ***Simple adjustment***
- ***UL listed, file #E129625***
- ***Solid-state reliability***
- ***Wide current range***
- ***Low cost***
- ***CSA certified, file #LR-92007***
- ***New SMART LED has no off-state leakage (SD-150)***
- ***Monitor 1-200 amps***
- ***Switch 150 mA continuous 30 VDC***
- ***5-yr unconditional warranty***

APPLICATION

- ***Direct connection to PLC and DDC inputs, for general status and proof-of-performance monitoring***
- ***Directly control light DC loads, such as lamps and relays, in response to the current of a monitored AC circuit***
- ***Replace differential pressure and air flow switches***
- ***Safety and alarm circuits***
- ***Monitor motors for status or broken belts and couplings***
- ***Heat tracing, heater monitoring***

SPECIFICATIONS

Operating temperature	-58° to 149°F (-50° to 65°C)
Case	ABS (meets UL flammability rating 94V-O)
Insulation class	600V
Off state leakage	**D150-1NC-A-NL**: 0.25 mA **D150-3A**: 0.25 mA (N.C. only)
Switching capability (uses NPN type open collector transistors)	Up to 150 mA continuous, 500 mA momentary; 30 VDC max. Voltage across closed switch is 0.8V max for N.O. and 1.6V max for N.C.
–C Option	Uses bi-polar transistor that reduces on-state voltage drop to< 0.2V. Switching capability < 5 mA
Voltage across closed switch	1.5V max

D150 DIMENSIONS	
Overall unit	2.125"H x 2.125"W x 1.0"D (5.4 cm x 5.4 cm x 2.54 cm)
Mounting base	3.25" long (8.26 cm) integral
Mounting centers	2.75" (6.99 cm) For alternate mounting, holes are provided on one side for #6 screws.
Through-hole	0.55" diameter, for up to#2/0 insulated wire THHN,THWN type insulation).
SD150 DIMENSIONS	
Overall unit	2.5"H x 2.6"W x 1.2"D (6.4 cm x 6.6 cm x 3.05 cm)
Mounting base	3.5" long (8.9 cm) integral
Mounting centers	3.0" (7.62 cm)
Through-hole	0.85" square opening, for up to #4/0 cable or larger, depending on insulation.

CURRENT OPERATED SWITCHES

D150 / SD150 SERIES

MONITORED AC CURRENT (AMPS)

Input Range	Jumper	Max Continuous	6 sec	1 sec
D150: 1-6 Amperes **SD150**: 1.5-6 Amperes	none	**D150**: 175A **SD150**: 200A	400A	600A
6-40 Amperes	mid	150A (Monitor motors in this range up to 133 FLA.)*	500A	800A
40-200 Amperes	high	**D150**: 175A **SD150**: 210A (Monitor motors in this range up to 200 FLA.)*	800A	1200A

*For motors with higher FLAs and/or longer start times, and for larger diameter conductors, use an external current transformer whose secondary current flows through the sensor.

SWITCHING CHARACTERISTICS

	Low Range		Mid Range		High Range	
Input (amps)	1.0*	6.0	6.0	40.0	40.0	200.0
Hysteresis (amps)						
Models SD150, D150-1A-NL	<0.15		<0.25		<0.5	
Models D150-2A, 3A (N.O.)	<0.2		<0.2		<0.2	
Models D150-3A (N.C. side) & D150-1NC-A-NL	<0.05	<0.2	0.15	0.8	0.7	5.0
Response times						
ON delays (ms)	150.0	200.0	70.0	60.0	40.0	70.0
OFF delays (ms)	60.0	30.0	40.0	20.0	30.0	20.0

*1.5A for **SD150**
**With sensor set to ranges above and current through sensor 5% above trip point.

INSTALLATION

1. Make sure that switched current (connected to screw terminals) is limited to 150 mA continuous, 500 momentary, and that applied voltage is no higher than 30 VDC.
2. Position the jumper for the desired range and observe maximum currents to prevent sensor failure. ***Monitoring excessive current can damage the sensor.***
3. Loop the wire through the hole. Looping the wire through the hole more than once multiplies the sensitivity but divides maximum currents.
4. The screw terminals represent a solid-state switch for controlling DC loads. Test the unit by using a circuit such as shown in wiring diagram. **An ohmmeter is not appropriate for this type of switch.**

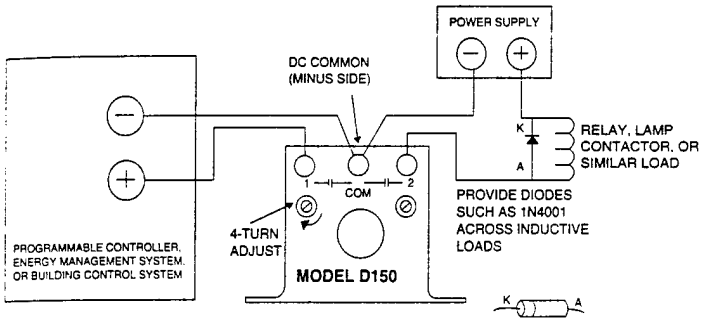
LED INDICATOR (For **SD150** only)
The LED indicates **three** states:
1. ***RAPID FLASHING***: Current has **tripped** the switch.
2. ***SLOW FLASHING***: Current is present but is **below the trip point.**
3. ***NO FLASHING***: Current is either **OFF** or **below the bottom of the range.**

SMART LED indicator on the SD150 has no off-state leakage.

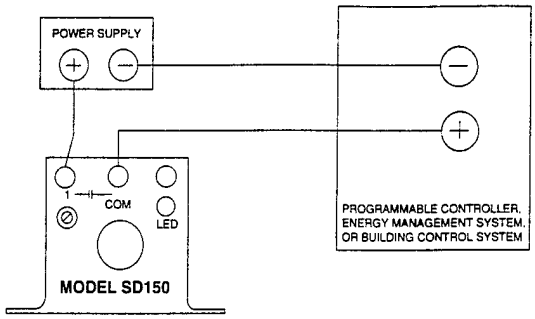
CURRENT OPERATED SWITCHES

D150 / SD150 SERIES

WIRING



SINKING CONFIGURATION
CAUSES A POSITIVE VOLTAGE
TO BE PULLED ("SUNK") TO GROUND



SOURCING CONFIGURATION
ACTS AS A FLOATING SWITCH TO
TURN ON ("SOURCE") A POSITIVE
VOLTAGE INTO A LOAD

ADJUSTMENT

1. With the sensor wired as shown, note the LED state. The LED should be off. If no LED, use a voltmeter across the sensor contacts. Turn on the motor or other load being monitored. With "LF" suffix sensors, set the motor to its lowest speed.
2. The sensor is shipped with the 4-turn adjustment set to the most sensitive position (CW). If the sensor now operates, turn the adjustment counter-clockwise (CCW) until the operation reverses. The LED or meter will indicate this action.
3. Now turn the adjustment CW until the sensor just operates its controlled circuit. It is desirable to turn the adjustment slightly CW beyond this threshold point to provide a margin for normal current variations.

PROBLEM	PROBABLE CAUSE & CORRECTION
Sensor appears to be ON all the time.	Check your circuit for sensitivity to Off-State Leakage. Check for reverse wiring polarity. If sensor is wired backward, the reverse polarity protection diode will make the sensor appear to be on.
Adjustment has no stops. Keeps turning.	The 4-turn adjustment pot has a slip-clutch which prevents damage at either end of its rotation. To know where the adjustment is, turn the pot 4 turns CW; this sets it to the most sensitive position, e.g., 1 amp on the 1 to 6 amp range.
Sensor does not switch at all, regardless of current level.	Adjustment pot is probably backed off completely (4 turns CCW), which disables the sensor. See item immediately above for more on this.

ORDERING INFORMATION

Model D150-1A-NL	**Normally Open (no LED)**
Model D150-1NC-A-NL	**Normally Closed (no LED)**
Model D150-2A	**2 N.O. Form A (no LED)**
Model D150-3A	**N.O. / N.C. Form C (no LED)**
—C Suffix	**Reduces switch on-state voltage to <0.2V**
—LF Suffix	**For variable-frequency systems down to 6 Hz**
SD150	**Split-core N.O. (with SMART LED)**

ELECTRIC / PNEUMATIC 3-WAY AIR VALVES

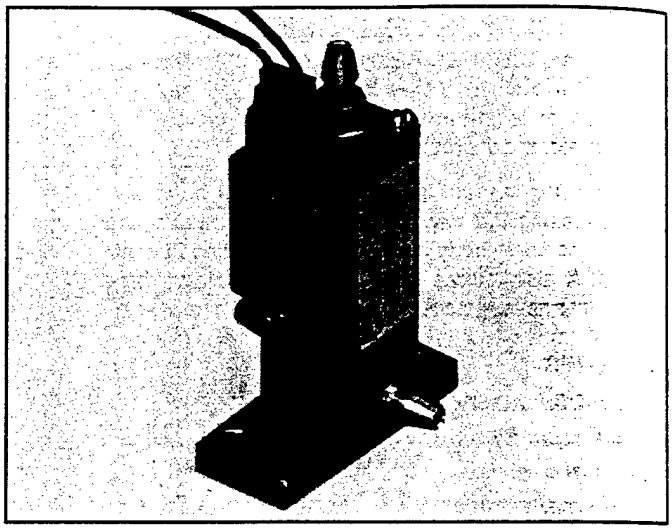
62X0.5=$31

MODEL EP3

DESCRIPTION

The **Model EP3** is an industrial-quality **Two-Position, Three-Way Solenoid Air Valve** for use in applications where the operation of a pneumatically-operated device is dependent upon an electrical circuit.

A momentary manual override pushbutton provides operation without closing the electrical circuit. An LED provides visual indication of the air valve's status. The valve can be mounted in any position with body mounting holes or with the mounting plate furnished with the valve. Each **EP3** also comes with 16" lead wires and three barbed fittings for 1/4" plastic tubing.



FEATURES

- ***LED indication***
- ***Industrial quality***
- ***High capacity***
- ***Manual override***
- ***Universal porting***
- ***Piping determines N.C., N.O., diverter, or selector***

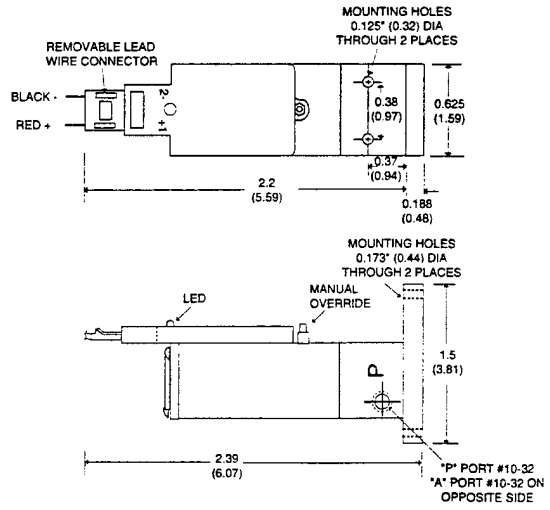
SPECIFICATIONS

Pressure range	0-50 psig
Flow constant	C_V 0.04
Air capacity	500 scim at 15 psig supply with 1 psig pressure drop
Media	Air or inert gases
Air connections	#10-32 (includes 3 barbed fittings)
Ambient temp range	0° to 122°F (-18° to 50°C)
Filtration	Recommended, 40 micron
Lubrication	Not required
Coil voltage/power	115V*/2.5W 24V*/2.5W
Voltage tolerance	+15%, -10% of rated coil voltage
Coil	Rated for continuous duty
Materials	Electroless nickel, Buna N, stainless steel, anodized aluminum
Wiring	16" lead wires with removable connector

*Voltage can be AC (50/60 Hz) or DC. For AC operation, use AC lead wire model #2587-7, included with 24 VAC and 120 VAC models.

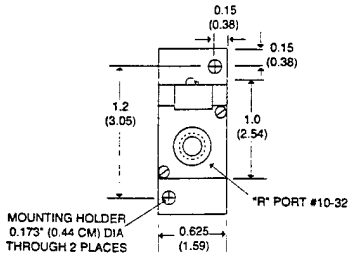
DIMENSIONS

in
(cm)



PORTS
(DE-ENERGIZED)

"A" — COMMON
"P" — NORMALLY CLOSED
"R" — NORMALLY OPEN



ORDERING INFORMATION

EP3-24VAC	**24 VAC 3-Way Air Valve**
EP3-24VDC	**24 VDC 3-Way Air Valve**
EP3-120VAC	**120 VAC 3-Way Air Valve**

HUMIDITY SENSORS

Model	Description	Manuf.	Range	Output	Accuracy	List	Code
CH-R	SPACE/ OFFICE	RE TECH	10-90%	4-20 mA	±5%	249.61	A
HW10K*	SPACE / EXECUTIVE DECORATOR	RE TECH	0-100%	4-20 mA	±3%	355.56	A
HD10K	DUCT & OUTSIDE AIR	RE TECH	0-100%	4-20 mA	±3%	383.34	A
EL3K	REPLACEABLE ELEMENT FOR HD10K, HW10K	RE TECH				208.34	A
HW20K	SPACE / EXECUTIVE DECORATOR	RE TECH	0-100%	4-20 mA	±2%	430.56	A
HD20K	DUCT	RE TECH	0-100%	4-20 mA	±2%	497.23	A
HO20K	OUTSIDE AIR	RE TECH	0-100%	4-20 mA	±2%	505.56	A
HMD20U	DUCT & OUTSIDE AIR	VAISALA	0-100%	4-20 mA	±2%	775.01	A
HMD30U	DUCT & OUTSIDE AIR	VAISALA	0-100%	0-5 VDC	±2%	972.23	A
WMK-20	OSA SUN SHIELD AND MOUNTING KIT FOR HD10K & HMD20U & HMD30U	VAISALA				41.67	A
HMW20U	ROOM	VAISALA	0-100%	4-20 mA	±2%	658.34	A
HMW30U	ROOM	VAISALA	0-100%	0-5 VDC	±2%	811.12	A
HMK20	HUMIDITY CALIBRATOR	VAISALA	0-100%	Visual	±2%	2291.69	A
HM34	PORTABLE HUMIDITY METER	VAISALA	0-100%	Visual	±2%	1097.23	B
CT-829-A-MH	ROOM	HY-CAL	0-90%	4-20 mA	±2%	450.00	A (0.5) = 225.
CT-829-H19-X20	DUCT	HY-CAL	0-90%	4-20 mA	±2%	486.12	A (0.5) = 243.
CT-829-H19-X21	DUCT & OUTSIDE AIR	HY-CAL	0-90%	4-20 mA	±2%	486.12	A
CT-880-C	EXPL. PROOF TRANSMITTER	HY-CAL	0-100%	4-20 mA	±2.5%	2555.58	A
SA-728-A	LOOP-POWERED METER	HY-CAL	0-100%	Visual		763.90	B
A21	ASPIRATED SENSOR HOUSING					277.78	B
T0*	THERMISTOR TEMPERATURE SENSOR OPTION					26.39	A
XMH**	MEMBRANE (PUSH BUTTON)					22.22	A

*Thermistor Temperature Sensor Option (see catalog for available curves)
**Membrane override push button option for HW20K only

HUMIDISTATS

Model	Description	Manuf.	Range	List	Code
W43A-14	ROOM	JOHNSON	0-70%	110.92	C
HC-101	ROOM	BARBER-COLMAN	10-90%	149.00	C
HC-201	DUCT	BARBER-COLMAN	15-95%	149.00	C

DEWPOINT SENSOR

Model	Description	Manuf.	Output	List	Code
DP-3	DEWPOINT	GENERAL EASTERN	4-20 mA	2152.80	A

ENTHALPY / WET BULB SENSOR

Model	Description	List	Code
EWB	ENTHALPY-WET BULB ASPIRATED ENCLOSURE (NO SENSOR)	1097.23	A
ST-EWB-91-XP(1)	1,000 ohm .00375 PLATINUM RTD MATCHED SENSORS WET OR DRY BULB SENSOR	106.81	A
T91U-5	4-20 mA TRANSMITTER 30 to 110°F ±.4°F	122.22	A
ST-EWB-3-XP(1)	4" THERMISTOR 30 to 200°F ±.4°F MATCHED SENSORS WET OR DRY BULB SENSOR	81.81	A
J-6317-50	5 GALLON TRANSLUCENT DISTILLED WATER RESERVOIR	20.83	A
CLS	INTAKE FILTER WITH DISPOSABLE ELEMENT	188.89	A

(1) In pairs only – price is per sensor

CONTROL RELAYS

Model	Type	Contact Rating	List	Code
RH1B-UAC 24 V	SPDT	10 AMP	14.75	B
RH1B-UAC 120 V	SPDT	10 AMP	14.75	B
RH1B-UDC 24 V	SPDT	10 AMP	13.42	B
RH2B-UAC 24 V	DPDT	10 AMP	15.72	B
RH2B-UAC 120 V	DPDT	10 AMP	15.72	B
RH2B-UDC 24 V	DPDT	10 AMP	14.92	B
RH2LB-UDC 12 V	DPDT-LATCHING	10 AMP	41.11	B
RH2LB-UDC 24 V	DPDT-LATCHING	10 AMP	41.11	B
RH3B-UAC 24 V	3PDT	10 AMP	19.44	B
RH3B-UAC 120 V	3PDT	10 AMP	19.44	B
RH3B-UDC 24 V	3PDT	10 AMP	18.56	B
RH4B-UAC 24 V	4PDT	10 AMP	23.81	B
RH4B-UAC 120 V	4PDT	10 AMP	23.81	B
RH4B-UDC 24 V	4PDT	10 AMP	23.08	B
*(L) SUFFIX	LIGHT		4.11	B
*(C) SUFFIX	CHECK BUTTON		2.06	B

*Not available with Single Pole Relays

HEAVY DUTY CONTROL RELAYS

RRR2P-UAC 24 V	DPDT	10 AMP	24.78	B
RR2P-UAC 120 V	DPDT	10 AMP	24.78	B
RR2P-UDC 24 V	DPDT	10 AMP	23.22	B
RR3PA-UAC 24 V	3PDT	10 AMP	29.69	B
RR3PA-UAC 120 V	3PDT	10 AMP	29.69	B
RR3PA-UDC 24 V	3PDT	10 AMP	29.06	B
(L) SUFFIX	LIGHT		4.11	B
(C) SUFFIX	CHECK BUTTON		2.06	B

CONTROL RELAY SOCKETS

Model	Type	List	Code
SH1B-05	SPDT-RH RELAY SOCKET	8.22	B
SH2B-05	DPDT-RH RELAY SOCKET	10.06	B
SH3B-05	3PDT-RH RELAY SOCKET	11.03	B
SH4B-05	4PDT-RH RELAY SOCKET	14.39	B
SR2P-06	DPDT-RR RELAY SOCKET	8.22	B
SR3P-06	3PDT-RR RELAY SOCKET	11.03	B

MOUNTING TRACK

BAM-1000	39" RAIL, ALUMINUM	11.28	B
DIN-3F	1 METER, STEEL	11.81	B

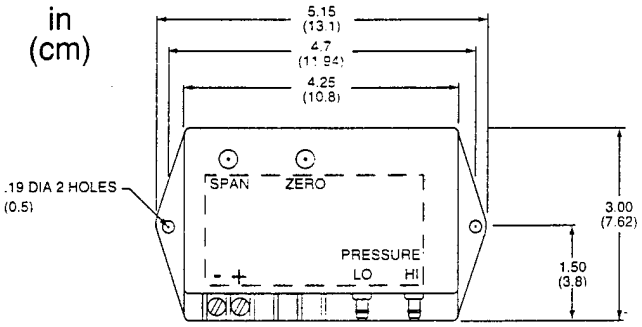
RELAY IN A BOX

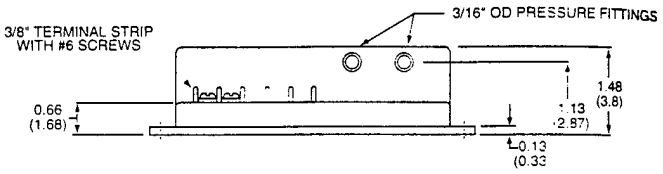
Model	Description	Rating	List	Code
RIBU1C	SPDT (MINI-RIB)	10 AMP	37.44	B
RIBU2C	2-SPDT	10 AMP	63.94	B
RIBU1S	SPDT W/HOA	10 AMP	45.56	B
RIBU2S	2-SPDT W/ 1-HOA	10 AMP	71.95	B
RIBU2S2	2-SPDT W/ 2-HOA	10 AMP	80.00	B
RIB24P	DPDT	20 AMP	71.67	B

DIFFERENTIAL PRESSURE TRANSMITTER (DC Powered)

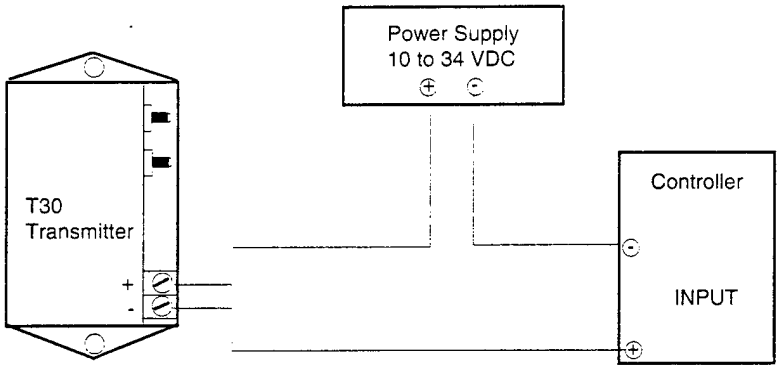
MODEL T30

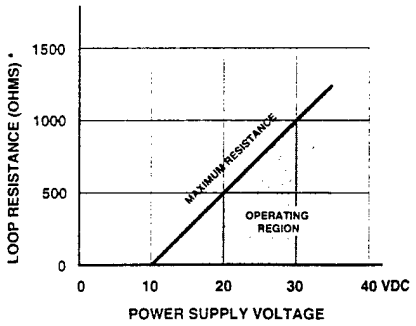
DIMENSIONS





WIRING





* Loop resistance = Wire resistance + receiver resistance

ORDERING INFORMATION

T30	MODEL
XXX	RANGE NUMBER (FROM FIGURE 1)
	OPTIONS
B	Bi-directional (12 mA @ Zero Pressure)

T30	—	001	B

Examples:

T30 - 001B

is a pressure transducer with a range of -0.1" W.C. to + 0.1" W.C. with 4 mA output @ -0.1" W.C., 12 mA @ 0" W.C. and 20 mA @ 0.1" W.C.

T30-050

is a pressure transducer with a range of 0-5.0" W.C. with 4 mA output @ 0" W.C. and 20 mA @ 5.0" W.C.

Figure 1

RANGE NUMBER	PRESSURE RANGE IN W.C.	PRESSURE RANGE MBAR
001	0-0.1	0-0.25
002	0-0.2	0-0.50
003	0-0.3	0-0.75
005	0-0.5	0-1.25
010	0-1.0	0-2.5
020	0-2.0	0-4.99
030	0-3.0	0-7.47
050	0-5.0	0-12.4
100	0-10.0	0-24.9

HY-CAL IMMERSION WELLS

Model	Description	List	Code
WEL-B-H	BRASS WELL	34.72	A
WEL-S-H	STAINLESS STEEL WELL	72.22	A (0.5) = 36.11

• Complete HY-CAL line available. Delivery on non-stock items or larger than stock quantities is 4 to 6 weeks.

TYPE LM334/AD590 SOLID-STATE SENSORS (CSI, OPTO-22)

Model	Description	List	Code
T102-1-F	SPACE/ OFFICE	31.25	A
T102-1-F-EX	SPACE / EXECUTIVE DECORATOR	37.50	A
T102-1-S-F	SPACE/ STAINLESS STEEL	40.28	A
T102-D-F	DUCT	47.64	A
T102-W-F*	IMMERSION / BRASS WELL	80.33	A
T102-WH-F	IMMERSION-HIGH TEMP	101.11	A
T102-OD-F	OUTSIDE AIR	71.03	A
T102-ORS-F	STRAP-ON (Also see APB-28)	36.81	A
T102-O-F	RAW SENSOR	20.28	A

TYPE LM335 SOLID-STATE SENSORS

Model	Description	List	Code
T102-1-I	SPACE/ OFFICE	31.25	A
T102-1-I-EX	SPACE / EXECUTIVE DECORATOR	37.50	A
T102-1-S-I	SPACE/ STAINLESS STEEL	40.28	A
T102-D-I	DUCT	47.64	A
T102-W-I	IMMERSION / BRASS WELL	80.33	A
T102-OD-I	OUTSIDE AIR	71.03	A
T102-ORS-I	STRAP-ON (Also see APB-28)	36.81	A
T102-O-I	RAW SENSOR	20.28	A

BULB WELLS

Model	Description	List	Code
WB-2.5	1/2" x 1/2" BRASS WELL - 2.5" ELEMENT	27.53	A
WB-4	1/2" x 1/2" BRASS WELL - 4" ELEMENT	32.50	A
WB-6	1/2" x 1/2" BRASS WELL - 6" ELEMENT	48.61	A
WB-9	1/2" x 1/2" BRASS WELL - 9" ELEMENT	73.61	A
WS-2.5	1/2" x 1/2" 304SS WELL - 2.5" ELEMENT	50.00	A
WS-4	1/2" x 1/2" 304SS WELL - 4" ELEMENT	58.33	A
WS-6	1/2" x 1/2" 304SS WELL - 6" ELEMENT	75.00	A
WS-9	1/2" x 1/2" 304SS WELL - 9" ELEMENT	97.22	A
WEL-B	PRECON BRASS WELL	25.00	A
WEL-S	PRECON STAINLESS STEEL WELL	66.11	A
WEL-B-H	HY-CAL BRASS WELL	34.72	A
WEL-S-H	HY-CAL STAINLESS STEEL WELL	72.22	A
FB-3	1/8" TO 1/2" ADAPTER	7.92	A
F2N-D	1/2" TO 1/8" ADAPTER-NYLON	5.56	A
F2B-D	1/2" TO 1/8" ADAPTER-BRASS	7.92	A

APPENDIX D

ALGORITHMS AND ENERGY CONSTANTS USED IN ANALYSIS

APPENDIX D

ALGORITHMS AND ENERGY CONSTANTS USED IN ANALYSIS

D.1 GENERAL

The EMCS energy savings were calculated using the guidelines presented in NCEL Manual CR 82.030, Standardized EMCS Energy Savings Calculations. This manual was used as a guide in preparing calculation formula and for computer simulation of energy savings. Energy savings formula simulations are managed by a computer analysis program developed by E M C Engineers, Inc.

The computer analysis program consists of the following:

- System variables which are derived from field survey data. (These are explained in Subsection D.2.)
- Energy constants which are developed for use with hand calculation for various EMCS control functions. (These are explained in Subsection D.3.)
- Energy savings formula. (These are described in Subsection D.4.)

The field data is entered into the computer analysis program, and the calculations are made using the indicated formula.

D.2 SYSTEM VARIABLE

Associated with the energy constants are variables which pertain to the system operation and capacities. These variables are used in formula along with energy-described constants to estimate the savings from the implementation of certain EMCS functions.

cfm HTG	=	Cfm of heating capacity for a given air handling system.
cfm CLG	=	Cfm of cooling capacity for a given air handling system.
EFF	=	An average annual conversion efficiency for heating systems at Fort Drum. The value used is representative of a typical boiler plant.
EFFHP	=	The typical motor efficiency for the name plate horsepower rating.
HRSON	=	The total number of hours a mechanical system would operate per year after EMCS installation (i.e., proposed hours of operation).

HRSAV = The number of hours saved per year which would result from the installation of an EMCS with a fixed time schedule (i.e., the number of hours/year a system is presently operating minus the proposed number of hours on/year).

kW/ton = The input power to mechanical refrigeration per output tonnage of air conditioning (kW/ton).

Motor HP = The rated horsepower of a mechanical system.

% Area = The percentage of a building which a heating system serves.

% OA = Percentage of outside air brought in by a mechanical system.

Tons = The rated cooling capacity output of an air conditioning unit (1 ton = 12,000 Btu).

Load Factor = The percent of loading of a motor.

MOSON = The total number of months a mechanical system would operate per year.

MBtu = The rated heating capacity output of a heating unit.

D.3 ENERGY CONSTANTS

Twelve categories of constants were developed for use in energy equations applicable to certain EMCS functions at Fort Drum. These constants are defined below.

The first three categories considered are used in equations which calculate the energy required to condition outside air. These equations apply to all buildings with systems using outside air.

1. COAU = Average energy (kWh) required to cool one cfm of OA to 85°F for one hour during the typical hours the building is unoccupied. This is the proposed unoccupied temperature setpoint for the cooling season.

   COAUC = Cooling-only systems related to COAU.

   COAUHC = Cooling and heating systems related to COAU.

2. HOAO = Average energy (Btu) required to heat one cfm of outside air to 68°F during the typical hours the building is occupied. This is the proposed occupied temperature for the heating systems.

HOAOH = Heating-only system related to HOAO.

HOAOHC = Heating and cooling system related to HOAO.

3. COAO = Average energy (kWh) required to cool one cfm of OA to 78°F for one hour during the typical hours the building is occupied. This is the proposed occupied temperature for the cooling systems.

COAOC = Cooling-only system related to COAO.

COAOHC = Heating and cooling system related to COAO.

4. DC = Estimated average percent of motor operating time which can be saved through duty cycling.

5. ECM = Average cooling energy (kWh) saved per hour per cfm, for an economizer system operating during occupied hours.

ECC = The value of ECM for cooling-only systems.

ECHC = The value of ECM for combined heating and cooling systems.

6. NSUC = Average electric energy (kWh) saved per cfm per hour for cooling air by shutting the system down during the hours the building is unoccupied.

NSUCC = Cooling-only system related to NSUC.

NSUCHC = Heating-cooling system related to NSUC.

7. DDC = Average electrical energy (kWh) saved per cfm per hour for cooling, by providing direct digital control during the hours the building is occupied.

DDCC = Cooling-only system related to DDC.

DDCHC = Heating-cooling system related to DDC.

8. NSC = Heating energy savings (MBtu) per UA resulting from unoccupied setback.

DSC = Heating energy savings (MBtu) per UA resulting from direct digital control.

9. FV = Heating energy savings (Mbtu) per cfm per hour by providing forced ventilation/recirculation for the first hour of daily system operation.

10. OPT = The number of hours saved per year through optimal start/stop program calculated from NCEL CR 82.030.

11. CHWR = Chilled water reset factor calculated from NCEL CR 82.030.

12. OAR = Outside air reset factor for hot water boilers calculated from NCEL 82.030.

D.4 ENERGY SAVINGS FORMULA FOR EMCS FUNCTIONS

The following equations are used in the computer analysis program to calculate savings resulting from using EMCS. The variables and constants used in the equations are explained in Subsection D.2 of this Appendix.

Time Schedule Start/Stop

a. Motor electrical energy savings:

kWh/yr = (motor hp) x (0.7456 kW/hp) x (80% Load Factor) x (HRSAV) / (EFFHP)

b. Outside air cooling savings:

kWh/yr = (cfm CLG) x (% OA) x (HRSAV) x (COAU)

Optimized Start/Stop

Motor electrical energy savings:

kWh/yr = (Motor hp) x (0.7456 kW/hp) x (80% Load Factor) x (OPT)/(EFFHP)

Demand Start/Stop

kW/yr = (Motor hp) x (0.7456 kW/hp) x (80% Load Factor) x (MOSON) x (DC) / (EFFHP)

Demand Chiller

kW/yr = (Tons capacity) x (kW/ton) x (MOSON) x (DC)

Savings by Ventilation and Recirculation

a. Heating savings:

MBtu/yr = (cfm HTG) x (% OA) x (FV) x $1/10^6$

b. Cooling savings:

kWh/yr = (cfm CLG) x (% OA) x (COAU) x (OPT)

Economizer

Cooling savings:

kWh/yr = (cfm CLG) x (ECHC) x (HRSON)

Outside Air Reset

MBtu/yr = (MBtu) x (OAR)

Chilled Water Reset

kWh/yr = (Tons capacity) x (CHWR)

Direct Digital Control

a. Building heating savings:

MBtu DSB = DSC x Area

b. System heating savings:

MBtu/yr = (% Area) x (MBtuDSB)

c. System cooling savings:

KWh/yr = (DSUC) x (cfm CLG) x (HRSON)

Unoccupied Setback

a. Building heating savings:

MBtu NSB = NSC x Area

b. System heating savings:

MBtu/yr = (% Area) x (MBtu NSB)

c. System cooling savings:

kWh/yr = (NSUC) x (cfm CLG) x (HRSAV)

D.5 DERIVATIONS OF ENERGY CONSTANTS

Computer simulations were performed to calculate many of the energy constants which are used in the computer analysis program. Simulations were performed on 28 different building category types, to derive constants which specifically relate to the type of building construction and its use.

Table D-1 below lists the 28 building categories simulated.

TABLE D-1
BUILDING CALCULATIONS

CATE-GORY	TYP. BLDG	USE	OCCUPANCY HOURS	OCCUPANCY DAYS
1	36	Medical Center	0700-1600	M-F
2	1750	Motor Repair Shop	0600-1730	M-F
3	2060	Mnt Hangar Avum, Hangar Zone	0600-2200	M-F
4	2060	Mnt Hangar Avum, Ops Zone	0000-2400	S-S
5	2065	AF Ops Building, 24HR Ops Zone	0000-2400	S-S
6	2065	AF Ops Building, Admin Zone	0600-1700	M-F
7	4230	Mini Mall w/ Gas	0000-2400	S-S
8	4305	Phys Fit Center	0645-2000	M-F
9	4530	SMA Building	0730-1630	S-S
10	10000	Div Cmd/Ctrl Building	0600-1800	M-F
11	10205	Dental Clinic	0700-1600	M-Sat
12	10207	Exchange/Club	0800-0300	S-S
13	10506	Clinic w/o Beds	0700-1600	M-Sat
14	10522	Adm & Supply, Enl Brk w/o Din, Admin Zone	0600-1700	M-F
15	10522	Adm & Supply, Enl Brk w/o Din, Barracks Zone	0000-2400	M-F
16	10550	Enl Pers Dining	0400-2400	S-S
17	10630	Bn HQ Building	0600-1700	S-S
18	10670	Veh Mnt Shop	0700-1900	S-S

TABLE D-1
BUILDING CALCULATIONS

CATE-GORY	TYP. BLDG	USE	OCCUPANCY HOURS	OCCUPANCY DAYS
19	10715	Post Safety/LEA, 1st Floor	0000-2400	S-S
20	10715	Post Safety/LEA, 2nd Floor	0600-1700	M-F
21	10730	Clo Sales/Main Retail	1000-2000	S-S
22	10745	Child Support Center	0700-1900	S-S
23	10785	Chapel/Rel Ed/Child Care, Rel Ed/Child Care Zone	0600-1800	M-F
24	10785	Chapel/Rel Ed/Child Care, Chapel Zone	0800-1400	Sun
25	10785	Chapel/Rel Ed/Child Care, Chapel Offices Zone	0600-1700	Sun-F
26	11050	Clinic w/o Beds/Supply/Incin, Main Zone	0700-1900	M-F
27	11050	Clinic w/o Beds/Supply/Incin, Emergency Zone	0000-2400	S-S
28	2060	Mnt Hangar Avum, Admin Zone	0600-1800	M-F

A summary of the energy constants determined by computer simulation are shown in Table D-2, starting on the following page.

TABLE D-2
ENERGY CONSTANTS

Constant	Category 1	Category 2	Category 3	Category 4	Category 5	Category 6	Category 7	Category 8	Category 9	Category 10
HOAUHC	0	0	0	0	0	0	0	0	0	0
HOAUH	0	0	0	0	0	0	0	0	0	0
COAUHC	0.000163	0	0	0	0	0	0	0	0	0.000008
COAUC	0.000425	0	0	0	0	0	0	0	0	0.000022
HOAOHC	92.200	121.660	0	0	0	12.415	0	77.485	150.00	9.066
HOAOH	150.000	198.240	0	0	0	24.899	0	126.260	245.000	14.774
COAOHC	0.00187	0	0	0	0	0	0	0	0	0.000008
COAOC	0.004870	0	0	0	0	0	0	0	0	0.000021
DC DUTY	0	0	0	0	0	0	0	0	0	0
DC DEMAND	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
ECC	0	0	0	0	0	0	0.000102	0	0	0
ECHC	0	0	0	0	0	0	0.000039	0	0	0
NSUCHC	0.000049	0	0	0	0	0	0	0	0	0.000008
NSUCC	0.000080	0	0	0	0	0	0	0	0	0.000013
DDCCHC	0.000204	0	0	0	0.000143	0	0.00007	0	0	0
DDCCC	0.000531	0	0	0	0.000429	0	0.000184	0	0	0
NSC	61000.00	58482.63	23030.56	0	0	28875.52	0	54079.42	80700.00	59665.73
DSC	4850.00	2040.12	0	4589.49	57944.89	7704.77	22630.80	9759.71	5760.00	8706.75
FV	0	0	0	0	0	0	0	0	0	6.150
CHWR	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57
OAR	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.40	7.4
OPT	188	188	188	188	188	188	188	188	188	188

TABLE D-2
ENERGY CONSTANTS
(Continued)

Constant	Category 11	Category 12	Category 13	Category 14	Category 15	Category 16	Category 17	Category 18	Category 19	Category 20
HOAUHC	0	0	0	0	0	0	0	0	0	0
HOAUH	0	0	0	0	0	0	0	0	0	0
COAUHC	0.00167	0.00373	0.000808	0	0	0	0	0	0	0
COAUC	0.00434	0.00967	0.00211	0	0	0	0	0	0	0
HOAOHC	142.477	28.365	139.724	110.072	0	24.345	158.00	9.678	0	97.912
HOAOH	232.161	46.219	227.676	220.749	0	39.669	257.00	15.769	0	196.364
COAOHC	0.00326	0.00220	0.001285	0	0	0	0	0	0	0
COAOC	0.00851	0.00573	0.003351	0	0	0	0	0	0	0
DC DUTY	0	0	0	0	0	0	0	0	0	00
DC DEMAND	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
ECC	0	0.000298	0	0	0	0	0	0	0.00000037	
ECHC	0	0.000114	0	0	0	0	0	0	0.00000012	0
NSUCHC	0.0005	0.00131	0.00017	0	0	0	0	0	0	0
NSUCC	0.000814	0.00213	0.000277	0	0	0	0	0	0	0
DDCCHC	0.000097	0	0.000132	0	0	0	0	0	0.0000060	0
DDCCC	0.000252	0	0.000344	0	0	0	0	0	0.000018	0
NSC	54069.77	32052.63	25939.13	48647.18	0	93908.84	62463.86	9258.21	0	21605.66
DSC	4353.31	11846.36	3810.62	5839.57	14014.94	33928.52	4842.60	2364.59	4063.56	1181.36
FV	0	63.71	0	0	0	0	0	0	0	320.63
CHWR	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57
OAR	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
OPT	188	188	188	188	188	188	188	188	188	188

TABLE D-2
ENERGY CONSTANTS
(Concluded)

Constants	Category 21	Category 22	Category 23	Category 24	Category 25	Category 26	Category 27	Category 28
HOAUHC	0	0	0	0	0	0	0	0
HOAUH	0	0	0	0	0	0	0	0
COAUHC	0.000704	0	0	0	0	0.000564	0	0
COAUC	0.00184	0	0	0	0	0.00137	0	0
HOAOHC	131.445	56.316	115.208	185.867	173.416	64.821	0	61.626
HOAOH	214.185	91.766	231.049	372.756	347.786	129.999	0	123.591
COAOHC	0.00229	0	0	0	0	0.00206	0	0
COAOC	0.00598	0	0	0	0	0.00615	0	0
DC DUTY	0	0	0	0	0	0	0	0
DC DEMAND	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
ECC	0.000059	0	0	0	0	0	0	0
ECHC	0.000023	0	0	0	0	0	0	0
NSUCHC	0.000094	0	0	0	0	0.000144	0	0
NSUCC	0.000154	0	0	0	0	0.000213	0	0
DDCCHC	0.000084	0	0	0	0	0.0000087	0.000224	0
DDCCC	0.00022	0	0	0	0	0.000026	0.000671	0
NSC	13725.21	97896.64	5696.09	251455.00	32959.70	48992.31	0	26974.13
DSC	4664.87	25478.95	9936.08	7010.58	12599.32	5036.48	62879.93	5140.01
FV	92.831	0	0	146.880	52.292	194.425	0	0.637
CHWR	9.57	9.57	9.57	9.57	9.57	9.57	9.57	9.57
OAR	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
OPT	188	188	188	188	188	188	188	188

The energy constants presented in Table D-2 were calculated by using computer simulation methods similar to those outlined in NCEL Manual CR 82.030 "Standardized EMCS Energy Savings Calculations." In general, this consists of simulating system and building operations as they exist using the DOE-2 program, and then performing additional simulations which reflect the implementation of various EMCS control functions. Comparison of the simulation runs indicates the quantity of energy reductions, if any. Care was taken to avoid duplicating energy savings by considering the interrelationships between the various EMCS functions which were being simulated.

The NCEL manual allows the energy savings determined from a building computer simulation to be proportioned to similar systems and buildings. The method used in this study to proportion energy savings to non-simulated buildings placed additional emphasis on the specific parameters of each mechanical system. Energy constants derived from the building computer simulations are expressed in terms which relate to mechanical system size and operation. This approach was made possible through the use of the computer analysis program, to provides an accurate calculation of the energy savings for each system and building.

Computer simulations were also used to determine the direct digital control and unoccupied setback savings available for each of the building types. Temperature setback savings for non-simulated buildings were then determined by applying the ratio of the total floor area of the non-simulated building to the total floor area of the simulated buildings with similar construction and operating schedules; the savings were then adjusted by this ratio.

Constants which were not determined by computer simulation were calculated by the manual methods outlined in NCEL Manual CR 82.030 as follows:

- Duty Cycling/Demand Limiting (DC)

  The duty cycling constant equals 10/60, or 0.17, based on the assumption in the NCEL Manual that a system may be shut down an average of 10 minutes per hour.

- Optimal Start/Stop (OPT)

  The number of hours saved per year through optimal start/stop (OPT):

  OPT = (WH x AND) - ERT

  where

  WH = Present warm-up time prior to occupancy = 2 hrs

  AND = Annual number of days total that warm-up is required in days per year

  ERT = Equipment run time total required for warm-up in hours per year

- Annual number of days warm up (AND).

Table D-3, below, illustrates the determination of AND (weather data for Ft. Drum) using the Manual criteria.

TABLE D-3
ANNUAL NUMBER OF DAYS WARM-UP

TEMPERATURE RANGE (°F)	OCCURRENCE BETWEEN 01:00 AND 08:00	NUMBER OF DAYS ANNUALLY (HOURS OF OCCURRENCE /8)
60/64	59	7.38
55/59	96	12.00
50/54	141	17.63
45/49	187	23.38
40/44	216	27.00
35/39	254	31.75
30/34	305	38.13
25/29	201	25.13
20/24	146	18.25
15/19	110	13.75
10/14	84	10.50
5/9	50	6.25
0/4	34	4.25
-5/-1	14	1.75
-10/-6	5	0.63
-15/-11	1	0.13
	TOTAL WARM-UP DAYS	238

- Warm-up is required 238 days annually.

- Equipment run time (ERT) is taken from NCEL Document CR 82.030, page 34

  - Annual degree days 7,601

  - From Figure 10, NCEL Manual with heavy construction U=0.12, (refer to Figure 10 at end of Appendix D)

  - ERT = 288 hours/yrs for heavy building construction

- Optimum Start/Stop:

  Therefore, OPT for heavy construction is:

  OPT = (2 x 272) - 294 = 250 hrs/yr

- Chilled water reset factor (CHWR)

Table D-4, below, illustrates the determination of CFLH (weather data for Fort Drum) using the Manual criteria.

TABLE D-4
FULL-LOAD HOURS COOLING

MEAN (°F) IN RANGE	09 TO 16 HOURS OF OCCURRENCE	DEGREE HOURS M = C x (H - 65°F)
97	3	96
92	24	648
87	94	2068
82	159	2703
77	201	2412
72	196	1372
67	144	288
	TOTAL DEGREE HOURS	9587

CHWR = CPT x REI x CFLH x degrees of reset

where

CPT = 0.72 kW per ton for typical centrifugal chiller

CPT = 0.915 kW per ton for typical reciprocating chiller

CFLH = equivalent full-load hours for cooling

= 9,587 / (87 - 65°F) = 436 hrs/yr

REI = rate of efficiency increase per °F increase of chilled water temperature

= 0.012 for reciprocating chiller from NCEL manual

Degrees of reset = 2°F (from NCEL manual)

Therefore,

for reciprocal, CHWR = 0.915 x 436 x 2 x .012 = 9.57 kW-hr/tons

- Hot water outside air reset factor (OAR)

OAR = HFLH x EI

where

HFLH = annual equivalent full load hours for heating in hr/yr

EI = efficiency; increase = 0.01 from NCEL manual CR 82.030, page 57.

Table D-5, below, illustrates the determination of HFLH (Weather data from Fort Drum) per NCEL manual.

TABLE D-5
FULL-LOAD HOURS HEATING

MEAN (°F) IN RANGE	09 TO 16 HOURS OF OCCURRENCE	DEGREE HOURS N = C x (65°F - H)
60/64	113	339
55/59	146	1,168
50/54	166	2,158
45/49	171	3,078
40/44	190	4,370
35/39	223	6,244
30/34	235	7,755
25/29	166	6,308
20/24	122	5,246
15/19	78	3,744
10/14	53	2,809
5/9	27	1,566
0/4	12	756
-5/-1	5	340
	TOTAL DEGREE HOURS	45,881

HFLH = 45,881 °F-hr/yr /65 - 3°F (design heating temp) = 740 hr/yr

Therefore,

OAR = 740 hr/yr x 0.01 = 9.86 hr/yr (with efficiency) 0.75 eff.

D.6 DERIVATION OF SYSTEM VARIABLES

The hours of system operation (HRSON) depend on the building occupancy and on the length of the heating and cooling seasons. Systems are switched over from heating to cooling in early May and back to heating in early October by facility maintenance personnel. Therefore, the heating season used for the purpose of analysis was from October 1 through May 15 (32 weeks), and the cooling season was from May 15 through September 30 (20 weeks).

A sample calculation for determining HRS ON/YR from the different occupancy schedules is shown below. An additional two hours for morning warming or cooling of the building prior to occupancy was added to the occupancy schedule to account for morning warm-up.

- Building occupied 0900-1700 (8 hrs/day, 7 days per week)

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{20\ \text{wks}}{\text{yr}} \times \frac{7\ \text{days}}{\text{wk}} \times \frac{10\ \text{hrs}}{\text{day}} = \frac{1400\ \text{hrs}}{\text{yr}}$$ (cooling only system)

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{32\ \text{wks}}{\text{yr}} \times \frac{7\ \text{days}}{\text{wk}} \times \frac{10\ \text{hrs}}{\text{day}} = \frac{2240\ \text{hrs}}{\text{yr}}$$ (heating only system)

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{52\ \text{wks}}{\text{yr}} \times \frac{7\ \text{days}}{\text{wk}} \times \frac{10\ \text{hrs}}{\text{day}} = \frac{3640\ \text{hrs}}{\text{yr}}$$ (heating & cooling system)

- Buildings occupied 24 hours per day, 7 days per week

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{20\ \text{wks}}{\text{yr}} \times \frac{7\ \text{days}}{\text{wk}} \times \frac{24\ \text{hrs}}{\text{day}} = \frac{3360\ \text{hrs}}{\text{yr}}$$ (cooling only system)

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{32\ \text{wks}}{\text{yr}} \times \frac{7\ \text{days}}{\text{wk}} \times \frac{24\ \text{hrs}}{\text{day}} = \frac{5376\ \text{hrs}}{\text{yr}}$$ (heating only system)

$$\frac{\text{HRS ON}}{\text{yr}} = \frac{52\ \text{wks}}{\text{yr}} \times \frac{7\ \text{days}}{\text{wk}} \times \frac{24\ \text{hrs}}{\text{day}} = \frac{8626\ \text{hrs}}{\text{yr}}$$ (heating & cooling system)

The hours of system operation which can be saved (HRSAV) as a result of installing the EMCS are dependent on the building occupancy and the present method of system operation. Presently, systems are not switched off, except that heating-only and cooling-only systems are shut down at spring and fall switchover. Time clocks were observed on several systems, however few include the pins required to switch equipment off.

The calculations for determining HRS SAV/YR included:

- Present hours of operation for system providing both heating and cooling = 8626 hrs/yr.
- Present hours of operation for system which provides only heating = 5376 hrs/yr.
- Buildings occupied 0700-1700 (10 hrs/day, 5 days/wk)

$$\frac{\text{HRS SAV}}{\text{yr}} = \frac{5376\ \text{hr}}{\text{yr}} - \frac{1920\ \text{hrs ON}}{\text{yr}} = \frac{3456\ \text{hrs}}{\text{yr}}$$ (heating only system)

$$\frac{\text{HRS SAV}}{\text{yr}} = \frac{8626\ \text{hrs}}{\text{yr}} - \frac{3120\ \text{hrs ON}}{\text{yr}} = \frac{5506\ \text{hrs}}{\text{yr}}$$ (heating & cooling system)

- Buildings occupied 0700-1800 (11 hrs/day, 7 days/wk)

$$\frac{\text{HRS SAV}}{\text{yr}} = \frac{5376\ \text{hrs}}{\text{yr}} - \frac{2912\ \text{hrs ON}}{\text{yr}} = \frac{2464\ \text{HRS}}{\text{yr}}$$ (heating only system)

$$\frac{\text{HRS SAV}}{\text{yr}} = \frac{8626\ \text{hrs}}{\text{yr}} - \frac{5512\ \text{hrs ON}}{\text{yr}} = \frac{3114\ \text{HRS}}{\text{yr}}$$ (heating & cooling system)

Other system variables used in the analysis included:

kW/Ton = .915 for chillers

D.7 SIMILAR BUILDINGS

Some of the buildings in the study were very similar to each other. The same basic design was reused numerous time with only slight modifications. When this occurred the building energy analysis could be performed only once on a representative building. The results are applied to the other similar buildings.

The groups of similar buildings are listed in Table D-6 on the following page. The building analyzed as representative of the group is also indicated.

TABLE D-6
BUILDINGS OF SIMILAR CONSTRUCTION

GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
1	36		Medical Center
2	1750	1240	Motor Repair Shop
3	2060	2050, 2072, 2074, 2070	Mnt Hangar Avum -Hangar Zone
4	2060		Mnt Hangar Avum -Ops Zone, 24-Hour Ops
5	2065		AF Ops building 24-Hour Ops
6	2065		AF Ops building Admin
7	4230		Mini-Mall w/ Gas
8	4305	10050	Physical Fitness Center
9	4530		SMA Building
10	10000		DIV CMD/CNTL Building
11	10205		Dental Clinic
12	10207	10502	Exchange/Club
13	10506		Clinic W/O Beds
14	10522	30, 173, 175, 4422, 4432, 4412, 4414, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Admin
15	10522	30, 173, 175, 4412, 4414, 4422, 4432, 10112, 10114, 10122, 10124, 10132, 10134, 10212, 10214, 10222, 10224, 10232, 10234, 10412, 10414, 10422, 10512, 10514, 10524, 10612, 10614, 10622, 10632, 10642, 10644	Adm & Supply, Enl Brk w/o Din-Barrack
16	10550	30, 175, 4450, 10150, 10250, 10450, 10650	Enl Pers Din

TABLE D-6
BUILDINGS OF SIMILAR CONSTRUCTION

(Concluded)

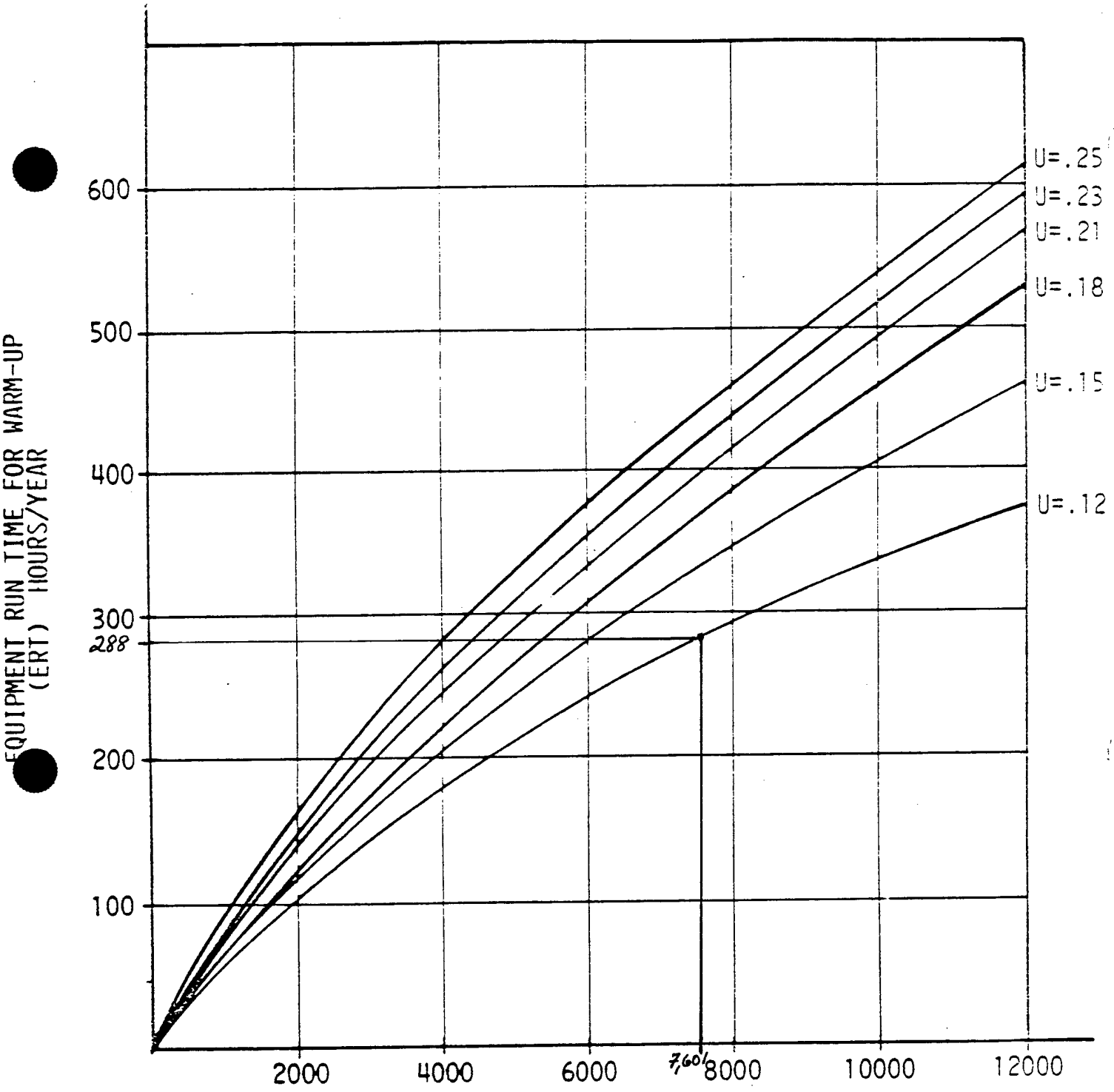
GROUP NO.	BUILDING ANALYZED	BUILDINGS WITH SIMILAR CONSTRUCTION	BUILDING USE
17	10630	119, 174, 4400, 4410, 4420, 4430, 10100, 10110, 10120, 10130, 10200, 10210, 10220, 10230, 10400, 10410, 10420, 10500, 10510, 10520, 10610, 10620, 10640	Bn HQ Bldg
18	10670	4475, 4485, 4486, 10170, 10270, 10470, 10480, 10570, 10580, 10660, 10680	Veh Mnt Shop
19	10715		Post Safety/LEA 1st Floor
20	10715		Post Safety/LEA 2nd Floor
21	10730		Clo Sales/Retail/ Commissary
22	10745	4325, 4330, 10790, 10785	Child Support Center
23	10785	4405, 10030	Chapel/Rel Ed/ Child Care Cnt -RE/CC Zone
24	10785	4405, 10030	Chapel Zone
25	10785	4405, 10030	Chapel Offices Zone
26	11050		Clinic W/O Beds/ Supply/Incin- Non-Emergency
27	11050		Clinic W/O Beds/ Supply/Incin- Emergency
28	2060	2050, 2070, 2072, 2074	Mnt Hangar Avum-Ops Zone M-F 0600-1700

D.8 MANPOWER SAVINGS

The estimated manpower savings for each type of system is based on the size, type, and operation of the system. The manpower savings per system resulting from remote monitoring for smaller systems is estimated to be about three hours a year. The savings for large system, such as large chillers and boilers, is estimated to be about six hours per year. The estimated manpower hours savings, estimate for each type of system used in the analysis, are given in Table D-7 below.

TABLE D-7
MAINTENANCE MANPOWER SAVINGS

SYSTEM NO.	SYSTEM TYPE	MANHOURS
1	H&V UNIT W/O RETURN FAN	3
2	H&V UNIT	3
3	SINGLE ZONE AHU W/O RETURN FAN	3
4	SINGLE ZONE AHU	3
5	SINGLE ZONE AHU W/ HUMIDIFICATION	3
6	MULTI-ZONE AHU	6
7	VAV AHU	6
8	CHILLER AND PUMPS	3
9	CONVERTER AND PUMPS	3
10	HOT WATER BOILER AND PUMPS	3
11	CONDENSING UNIT	3
12	PERIMETER RADIATION CONV. & PUMPS	3
13	STEAM HUMIDIFICATION	3
14	VENTILATION UNIT	3



HEAVY CONSTRUCTION

FIGURE 10

APPENDIX E

HVAC SYSTEM ECONOMIC SUMMARY

SYSTEM SAVINGS DESCRIPTIONS

System

1. H&V Unit Without Return Fan

   Function and Manpower Savings

   1 Scheduled Start/Stop Control
     Optimum Start/Stop Control
     Demand Limit
     Night Set Back
     Forced Ventilation
   2 Economizer
   3 DDC
   4 Manhours

2. H&V Unit

   Function and Manpower Savings

   1 Scheduled Start/Stop Control
     Optimum Start/Stop Control
     Demand Limit
     Night Setback
     Forced Ventilation
   2 Economizer
   3 DDC
   4 Manhours

3. Single Zone AHU Without Return Fan

   Function and Manpower Savings

   1 Scheduled Start/Stop Control
     Optimum Start/Stop Control
     Demand Limit
     Night Setback
     Forced Ventilation
   2 Economizer
   3 DDC
   4 Manhours

4. Single Zone AHU

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Demand Limit
Night Setback
Forced Ventilation
2 Economizer
3 DDC
4 Manhours

5. Single Zone AHU With Humidification

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Demand Limit
Night Setback
Forced Ventilation
2 Economizer
3 DDC
4 Manhours

6. Multi-Zone AHU

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Demand Limit
Night Setback
Forced Ventilation
2 Economizer
3 DDC
4 Manhours

7. VAV AHU

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Demand Limit
Night Setback
Forced Ventilation
2 Economizer
3 DDC
4 Manhours

8. Chiller and Pumps

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Demand Limit
Night Setback
4 Manhours
6 Chilled Water Reset

9. Converter and Pumps

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Unoccupied Setback
4 Manhours
7 Hot Water Reset

10. Hot Water Boiler and Pumps

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Unoccupied Setback
4 Manhours
7 Hot Water Reset

11. Condensing Unit

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Unoccupied Setback
4 Manhours

12. Perimeter Radiation Converter/Boiler and Pumps

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Unoccupied Setback
3 DDC
4 Manhours

13. Steam Humidifier

Function and Manpower Savings

4 Manhours

14. Ventilation

Function and Manpower Savings

1 Scheduled Start/Stop Control
Optimum Start/Stop Control
Demand Limit
4 Manhours

Table E-1 lists the building summary savings, costs, EMCS points, and building economics for the HVAC systems evaluated.

Table E-2 lists building and HVAC system savings, costs, EMCS points, and economic summary for HVAC systems and functions for all buildings.

TABLE E-1
FORT DRUM, NEW YORK
ENERGY MONITORING AND CONTROL SYSTEM

BLDG. NO.	BLDG. DESCRIPTION	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL EMCS POINT	$ BLDG. INST. COST	$ BLDG. PANEL COST	$ TOTAL BLDG. COST	TOTAL $ DISC. SAVING	SIR
176	ELEC SUBSTATION										1		1	100	3,650	3,750		100.0
11130	ELEC SUBSTATION										1		1	100	3,650	3,750		100.0
4530	SMA BUILDING	6	817,033	11,235			57	95,420	11	21	17	23	72	11,833	8,600	20,433	825,128	40.4
4305	PHYS FITNESS CENTER		241,752		2,007		15	22,062	4	5	7	12	28	5,065	5,450	10,515	196,528	18.7
1240	TOE MAINT		737		2,444		9	10,619	3	2	5	3	13	1,925	4,100	6,025	101,702	16.9
4475	VEH MAINT SHOP		788,324	983			42	48,295	14	25	18	30	87	14,609	9,950	24,559	410,587	16.7
10670	VEH MAINT SHOP		761,142	521			42	44,773	14	25	18	30	87	14,609	9,950	24,559	380,055	15.5
10660	VEH MAINT SHOP		761,142	505			42	44,702	14	25	18	30	87	14,609	9,950	24,559	379,433	15.4
10680	VEH MAINT SHOP		761,142	481			42	44,593	14	25	18	30	87	14,609	9,950	24,559	378,478	15.4
4485	VEH MAINT SHOP		761,142	461			42	44,506	14	25	18	30	87	14,609	9,950	24,559	377,708	15.4
10470	VEH MAINT SHOP		761,142	403			42	44,250	14	25	18	30	87	14,609	9,950	24,559	375,451	15.3
10480	VEH MAINT SHOP		761,142	359			42	44,059	14	25	18	30	87	14,609	9,950	24,559	373,765	15.2
4486	VEH MAINT SHOP		761,142	356			42	44,044	14	25	18	30	87	14,609	9,950	24,559	373,633	15.2
10580	VEH MAINT SHOP		761,142	352			42	44,025	14	25	18	30	87	14,609	9,950	24,559	373,469	15.2
10170	VEH MAINT SHOP		761,142	337			42	43,962	14	25	18	30	87	14,609	9,950	24,559	372,910	15.2
10270	VEH MAINT SHOP		761,142	337			42	43,962	14	25	18	30	87	14,609	9,950	24,559	372,910	15.2
10570	VEH MAINT SHOP		761,142	336			42	43,956	14	25	18	30	87	14,609	9,950	24,559	372,863	15.2
10050	PHYS FIT CENTER		318,367	9,077			45	58,342	26	38	26	53	143	24,695	14,000	38,695	507,824	13.1
10785	CHILD CARE CNTR		467,997	1,470			33	32,741	11	21	21	24	77	12,430	9,050	21,480	279,562	13.0
10745	CHILD SUPPORT CENTER		33,152	2,909			15	14,944	5	9	5	12	31	5,108	5,450	10,558	130,955	12.4
10790	YOUTH CENTER		32,954	2,856			15	14,695	5	9	5	12	31	5,108	5,450	10,558	128,769	12.2
4325	SKILL DEV CENTER		32,954	2,852			15	14,681	5	9	5	12	31	5,108	5,450	10,558	128,645	12.2
10205	DENTAL CLINIC	33	147,255	1,085			15	13,366	5	5	5	10	25	4,441	5,000	9,441	114,867	12.2
2070	MNT HANGER AVUM		111,928		4,778		45	27,348	14	16	25	21	76	12,240	9,050	21,290	254,660	12.0
10730	CLO SALES STORE & EXCH MAIN		393,625	1,704			42	29,886	11	31	11	24	77	12,620	9,050	21,670	255,739	11.8
1750	MOTOR REPAIR SHOP		81,570		2,290		18	14,563	6	9	7	14	36	6,093	5,900	11,993	134,379	11.2
10030	UNIT CHAPEL		154,468	760			12	12,042	3	6	5	10	24	4,251	5,000	9,251	103,149	11.2
4405	UNIT CHAPEL		154,468	760			12	12,042	3	6	5	10	24	4,251	5,000	9,251	103,149	11.2
174	CO HQ		21,020		2,115		12	10,387	4	6	4	10	24	4,236	5,000	9,236	98,155	10.6
175	BRKS & MESS HALL		95,778	2,110			24	15,025	7	13	11	15	46	7,664	6,800	14,464	130,451	9.0
10506	CLINICS W/O BEDS	15	103,080	492			12	8,154	4	4	4	7	19	3,257	4,550	7,807	69,826	8.9
10250	ENL PERS DIN		95,778	2,027			21	14,599	7	13	11	15	46	7,664	6,800	14,464	126,718	8.8
10150	ENL PERS DIN		95,778	2,020			21	14,569	7	13	11	15	46	7,664	6,800	14,464	126,454	8.7
10690	ADP BUILDING	27	115,525	1,602			39	14,349	9	13	10	15	47	7,641	6,800	14,441	123,997	8.6
11050	CLINIC W/O BEDS	16	231,210	1,445	1,743		84	28,228	23	23	23	35	104	18,499	10,850	29,349	249,749	8.5
10550	ENL PERS DIN		123,108	3,336			39	22,228	13	29	17	28	87	14,402	9,950	24,352	193,316	7.9
4350	OPEN DIN NCO		87,483	1,587			21	12,203	7	13	11	15	46	7,664	6,800	14,464	105,765	7.3
4450	ENL PERS DIN		95,778	1,469			21	12,137	7	13	11	15	46	7,664	6,800	14,464	105,031	7.3
10650	ENL PERS DIN		95,778	1,454			21	12,073	7	13	11	15	46	7,664	6,800	14,464	104,464	7.2
30	BRKS & MESS HALL		95,778	11	1,454		27	12,015	7	14	11	17	49	8,437	6,800	15,237	108,808	7.1
10450	ENL PERS DIN		97,154	1,161			21	10,854	7	13	11	15	46	7,664	6,800	14,464	93,698	6.5
2074	MNT HANGER AVUM		98,973		1,190		30	11,076	8	12	15	19	54	9,188	7,250	16,438	99,567	6.1
10110	BN HQ BLDG		45,212	1,680			24	10,361	8	12	8	19	47	8,280	6,800	15,080	90,305	6.0
2050	MNT HANGER AVUM		98,973		988		30	10,217	8	11	16	16	51	8,523	7,250	15,773	91,326	5.8
2049	WSAAF HANGAR		98,973		982		30	10,192	8	11	16	16	51	8,523	7,250	15,773	91,085	5.8
10000	DIV CMD/CNTRL BLDG	17	82,028	4,514			78	26,070	26	48	26	49	149	25,006	14,450	39,456	227,677	5.8
119	BN HQ & CLASSROOM		21,020		1,009		12	5,680	4	6	4	10	24	4,236	5,000	9,236	52,971	5.7
36	MEDICAL CENTER	54	206,680		1,827		39	20,228	12	29	18	37	96	16,331	10,400	26,731	180,182	6.7
10715	POST SAFETY/LEA	1	74,210	465			18	6,474	4	8	5	12	29	5,113	5,450	10,563	55,555	5.3
10207	EXCHANGE/CLUB	48	104,469	900	23		24	10,588	12	12	13	19	56	10,091	7,250	17,341	91,189	5.3
4400	RGT HQ BUILDING		21,020	925			12	5,469	4	6	4	10	24	4,236	5,000	9,236	47,720	5.2
2072	MNT HANGER AVUM		56,391		1,214		33	8,907	9	10	16	17	52	8,703	7,250	15,953	81,314	5.1
10130	BN HQ BLDG		21,020	897			12	5,347	4	6	4	10	24	4,236	5,000	9,236	46,648	5.1
10620	BN HQ BLDG		21,020	892			12	5,323	4	6	4	10	24	4,236	5,000	9,236	46,442	5.0
10502	OPEN DIN CONSOL	48	88,627	884	23		24	9,653	9	12	13	19	53	9,506	7,250	16,756	83,244	5.0
4420	BN HQ BLDG		21,020	877			12	5,259	4	6	4	10	24	4,236	5,000	9,236	45,871	5.0
4410	BN HQ BLDG		21,020	866			12	5,209	4	6	4	10	24	4,236	5,000	9,236	45,432	4.9

TABLE E-1
FORT DRUM, NEW YORK
ENERGY MONITORING AND CONTROL SYSTEM

BLDG. NO.	BLDG. DESCRIPTION	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL EMCS POINT	$ BLDG. INST. COST	$ BLDG. PANEL COST	$ TOTAL BLDG. COST	TOTAL $ DISC. SAVING	SIR
4330	RECREATION CNTR		46,793		188		6	3,590	2	3	3	5	13	2,315	4,100	6,415	31,315	4.9
10420	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10510	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10520	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10640	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10120	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
4430	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10410	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10610	BN HQ BLDG		21,020	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10630	BN HQ BLDG		21,019	840			12	5,094	4	6	4	10	24	4,236	5,000	9,236	44,418	4.8
10210	BN HQ BLDG		21,020	840			12	5,093	4	6	4	10	24	4,236	5,000	9,236	44,414	4.8
10230	BN HQ BLDG		21,020	840			12	5,093	4	6	4	10	24	4,236	5,000	9,236	44,414	4.8
10220	BN HQ BLDG		21,020	840			12	5,093	4	6	4	10	24	4,236	5,000	9,236	44,414	4.8
10400	BDE HQ BLDG		21,020	759			12	4,737	4	6	4	10	24	4,236	5,000	9,236	41,278	4.5
10500	BDE HQ BLDG		21,020	759			12	4,737	4	6	4	10	24	4,236	5,000	9,236	41,278	4.5
10100	BRIGADE HQ BLDG		21,020	759			12	4,737	4	6	4	10	24	4,236	5,000	9,236	41,278	4.5
10200	BRIGADE HQ BLDG		21,020	759			12	4,737	4	6	4	10	24	4,236	5,000	9,236	41,274	4.5
4525	DOL WAREHOUSE		106,964	713			39	9,775	9	22	12	27	70	12,443	8,600	21,043	83,908	4.0
2060	MNT HANGER AVUM		12,720		993		33	5,581	7	9	14	14	44	7,523	6,350	13,873	52,088	3.8
4422	ENL BK W/O DIN			421			12	2,096		3		5	8	1,691	3,650	5,341	18,400	3.4
2065	AF OPS BLDG	119	22,303		1,315		75	9,129	20	20	24	25	89	14,529	9,950	24,479	83,783	3.4
10134	ENL BK W/O DIN + ADM & SUPPLY		27,388	760			36	5,568	9	11	9	17	46	7,580	6,800	14,380	48,339	3.4
10414	ENL BK W/O DIN + ADM & SUPPLY		27,388	752			36	5,535	9	11	9	17	46	7,580	6,800	14,380	48,052	3.3
10234	ENL BK W/O DIN + ADM & SUPPLY		27,388	733			36	5,450	9	11	9	17	46	7,580	6,800	14,380	47,306	3.3
10412	ENL BK W/O DIN + ADM & SUPPLY		27,388	699			36	5,301	9	11	9	17	46	7,580	6,800	14,380	45,992	3.2
10612	ENL BK W/O DIN + ADM & SUPPLY		27,388	686			36	5,245	9	11	9	17	46	7,580	6,800	14,380	45,495	3.2
10622	ENL BK W/O DIN + ADM & SUPPLY		27,388	676			36	5,198	9	11	9	17	46	7,580	6,800	14,380	45,083	3.1
10632	ENL BK W/O DIN + ADM & SUPPLY		27,388	667			36	5,158	9	11	9	17	46	7,580	6,800	14,380	44,734	3.1
10512	ENL BK W/O DIN + ADM & SUPPLY		27,388	666			36	5,156	9	11	9	17	46	7,580	6,800	14,380	44,710	3.1
10232	ENL BK W/O DIN + ADM & SUPPLY		27,388	660			36	5,130	9	11	9	17	46	7,580	6,800	14,380	44,485	3.1
10212	ENL BK W/O DIN + ADM & SUPPLY		27,388	660			36	5,129	9	11	9	17	46	7,580	6,800	14,380	44,477	3.1
10222	ENL BK W/O DIN + ADM & SUPPLY		27,388	660			36	5,129	9	11	9	17	46	7,580	6,800	14,380	44,477	3.1
4412	ENL BK W/O DIN + ADM & SUPPLY		27,388	654			36	5,102	9	11	9	17	46	7,580	6,800	14,380	44,236	3.1
4432	ENL BK W/O DIN			434			12	2,156		4		7	11	2,464	4,100	6,564	18,925	2.9
4230	MINI MALL W/GAS		56,390	245			18	4,526	6	8	8	17	39	7,156	6,350	13,506	38,727	2.9
10132	ENL BK W/O DIN + ADM & SUPPLY		27,388	506			36	4,450	9	11	9	17	46	7,580	6,800	14,380	38,494	2.7
10112	ENL BK W/O DIN + ADM & SUPPLY		5,337	525			21	3,026	4	10	4	13	31	5,654	5,450	11,104	26,445	2.4
10122	ENL BK W/O DIN + ADM & SUPPLY		5,337	525			21	3,026	4	10	4	13	31	5,654	5,450	11,104	26,445	2.4
10224	ENL BK W/O DIN + ADM & SUPPLY		5,337	523			21	3,018	4	10	4	13	31	5,654	5,450	11,104	26,375	2.4
10214	ENL BK W/O DIN + ADM & SUPPLY		5,337	523			21	3,018	4	10	4	13	31	5,654	5,450	11,104	26,375	2.4
10614	ENL BK W/O DIN + ADM & SUPPLY		5,337	509			21	2,957	4	10	4	13	31	5,654	5,450	11,104	25,835	2.3
10422	ENL BK W/O DIN + ADM & SUPPLY		5,337	505			21	2,940	4	10	4	13	31	5,654	5,450	11,104	25,687	2.3
10124	ENL BK W/O DIN + ADM & SUPPLY		5,337	503			21	2,930	4	10	4	13	31	5,654	5,450	11,104	25,598	2.3
10114	ENL BK W/O DIN + ADM & SUPPLY		5,337	503			21	2,930	4	10	4	13	31	5,654	5,450	11,104	25,598	2.3
10642	ENL BK W/O DIN + ADM & SUPPLY		5,337	501			21	2,922	4	10	4	13	31	5,654	5,450	11,104	25,524	2.3
10732	CLASS VI	2	19,885			91	9	1,831	3	3	4	5	15	2,535	4,550	7,085	16,084	2.3
10524	ENL BK W/O DIN + ADM & SUPPLY		5,337	489			21	2,869	4	10	4	13	31	5,654	5,450	11,104	25,062	2.3
10514	ENL BK W/O DIN + ADM & SUPPLY		5,337	489			21	2,867	4	10	4	13	31	5,654	5,450	11,104	25,039	2.3
2792	AMMO INSPECTION		1,187	292			6	1,472	1	2	1	5	9	1,761	4,100	5,861	12,914	2.2
10522	ENL BK W/O DIN + ADM & SUPPLY		5,467	502			21	2,933	5	10	5	13	33	5,943	5,900	11,843	25,623	2.2
10644	ENL BK W/O DIN + ADM & SUPPLY		5,337	438			21	2,642	4	10	4	13	31	5,654	5,450	11,104	23,057	2.1
4414	ENL BK W/O DIN + ADM & SUPPLY		5,337	378			21	2,379	4	10	4	13	31	5,654	5,450	11,104	20,745	1.9
21510	MAIN WASH					134	39	1,593		10		15	25	5,026	5,000	10,026	14,372	1.4
173	BARRACKS				44		6	308				3	3	794	3,650	4,444	2,829	0.6
10710	FIRE STATION			26			9	293		3		5	8	1,800	3,650	5,450	2,534	0.5
11142	EMTOMOLOGY FAC			3			3	75				3	3	794	3,650	4,444	644	0.1
11144	REFUSE COLL BLDG			3			3	75				3	3	794	3,650	4,444	644	0.1

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
30	BRKS & MESS HALL	AHU1	1	4						3	60						512	N/A	N/A
30	BRKS & MESS HALL	AHU1	1	1		12,801.70		174.40			1,442	1	1	1	1	604	13,053	21.6	0.4
30	BRKS & MESS HALL	AHU1	1	3				63.00			268		1		1	363	2,573	7.1	1.4
30	BRKS & MESS HALL	AHU2	2	4						3	60						512	N/A	N/A
30	BRKS & MESS HALL	AHU2	2	1		15,122.30		200.80			1,681	1	1	2	1	756	15,207	20.1	0.4
30	BRKS & MESS HALL	AHU2	2	3				72.50			308		1		1	363	2,961	8.2	1.2
30	BRKS & MESS HALL	AHU3	2	1		18,308.00		177.20			1,755	1	1	2	1	756	15,719	20.8	0.4
30	BRKS & MESS HALL	AHU3	2	4						3	60						512	N/A	N/A
30	BRKS & MESS HALL	AHU3	2	3				64.00			272		1		1	363	2,614	7.2	1.3
30	BRKS & MESS HALL	AHU4	2	1		27,177.00		283.50			2,693	1	1	2	1	756	24,169	32.0	0.3
30	BRKS & MESS HALL	AHU4	2	3				102.40			436		1		1	363	4,182	11.5	0.8
30	BRKS & MESS HALL	AHU4	2	4						3	60						512	N/A	N/A
30	BRKS & MESS HALL	AHU5	2	4						3	60						512	N/A	N/A
30	BRKS & MESS HALL	AHU5	2	3				42.70			182		1		1	363	1,744	4.8	2.0
30	BRKS & MESS HALL	AHU5	2	1		11,550.20		118.10			1,134	1	1	2	1	756	10,174	13.5	0.7
30	BRKS & MESS HALL	AHU6	1	4						3	60						512	N/A	N/A
30	BRKS & MESS HALL	AHU6	1	1		7,181.90		18.90			473	1	1	1	1	604	4,099	6.8	1.3
30	BRKS & MESS HALL	AHU6	1	3				6.80			29		1		1	363	278	0.8	12.5
30	BRKS & MESS HALL	FTR1	12	4						3	60						512	N/A	N/A
30	BRKS & MESS HALL	HE1	9	1		3,637.00		87.40			571	1		1		289	5,254	18.2	0.5
30	BRKS & MESS HALL	HE1	9	3				31.60			134						1,290	N/A	N/A
30	BRKS & MESS HALL	HE1	9	4						3	60						512	N/A	N/A
30	BRKS & MESS HALL	HE1	9	7				11.10			47		1		2	773	453	0.6	16.4
30	BRKS & MESS HALL	HE1A	9	7			11.10				49		1		2	773	431	0.6	15.8
30	BRKS & MESS HALL	HE1A	9	4						3	60						512	N/A	N/A
36	MEDICAL CENTER	AC1M	3	1	3.1	6,406.50		118.60			876	1	1	1	1	604	7,994	13.2	0.7
36	MEDICAL CENTER	AC1M	3	3		281.50		9.60			56		2		1	534	522	1.0	9.5
36	MEDICAL CENTER	AC1M	3	4						3	60						512	N/A	N/A
36	MEDICAL CENTER	AC2M	6	4						6	120						1,024	N/A	N/A
36	MEDICAL CENTER	AC2M	6	1	7.3	18,319.60		118.60			1,557	1		2	2	728	13,759	18.9	0.5
36	MEDICAL CENTER	AC2M	6	3		1,576.10		9.60			127		6		4	1,698	1,122	0.7	13.4
36	MEDICAL CENTER	AC3M	6	3		1,715.00		9.60			135		6		4	1,698	1,187	0.7	12.6
36	MEDICAL CENTER	AC3M	6	4						6	120						1,024	N/A	N/A
36	MEDICAL CENTER	AC3M	6	1	13.9	30,575.80		118.60			2,273	1		2	2	728	19,825	27.2	0.3
36	MEDICAL CENTER	AC4M	6	1	13.9	34,101.50		118.60			2,466	1		2	2	728	21,459	29.5	0.3
36	MEDICAL CENTER	AC4M	6	3		2,774.40		9.60			193		6		4	1,698	1,677	1.0	8.8
36	MEDICAL CENTER	AC4M	6	4						6	120						1,024	N/A	N/A
36	MEDICAL CENTER	ACC1M	8	1	10.8	8,010.50					512	2		2		578	4,345	7.5	1.1
36	MEDICAL CENTER	ACC1M	8	6		199.10					11						92	N/A	N/A
36	MEDICAL CENTER	ACC1M	8	4						3	60				2	602	512	0.9	10.0
36	MEDICAL CENTER	ACC2M	8	4						3	60				2	602	512	0.9	10.0
36	MEDICAL CENTER	ACC2M	8	6		199.10					11						92	N/A	N/A
36	MEDICAL CENTER	ACC2M	8	1	10.8	8,010.50					512	2		2		578	4,345	7.5	1.1
36	MEDICAL CENTER	AHU1A	6	1	10.8	25,126.20		214.40			2,361	1		2	2	728	21,031	28.9	0.3
36	MEDICAL CENTER	AHU1A	6	3		2,574.30		17.30			214		6		4	1,698	1,899	1.1	7.9
36	MEDICAL CENTER	AHU1A	6	4						6	120						1,024	N/A	N/A
36	MEDICAL CENTER	B1	10	4						3	60						512	N/A	N/A
36	MEDICAL CENTER	B1	10	1		693.80		357.40			1,558	1		2		383	14,917	38.9	0.2
36	MEDICAL CENTER	B1	10	7				18.10			77				2	602	739	1.2	7.8
36	MEDICAL CENTER	B2	10	1		694.00		357.40			1,558	1		2		383	14,917	38.9	0.2
36	MEDICAL CENTER	B2	10	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
36	MEDICAL CENTER	B2	10	7				18.10			77				2	602	739	1.2	7.8
36	MEDICAL CENTER	HV1	1	3				5.80			25		1		1	363	237	0.7	14.7
36	MEDICAL CENTER	HV1	1	4						3	60						512	N/A	N/A
36	MEDICAL CENTER	HV1	1	1		3,083.50		71.50			473	1	1	1	1	604	4,349	7.2	1.3
119	BN HQ & CLASSROOM	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
119	BN HQ & CLASSROOM	HE1	9	4						3	60						512	N/A	N/A
119	BN HQ & CLASSROOM	HE1	9	7				1.90			8		1		2	773	78	0.1	95.6
119	BN HQ & CLASSROOM	HE2-PER	12	1		2,397.80		700.60			3,112	1		1	2	576	29,722	51.6	0.2
119	BN HQ & CLASSROOM	HE2-PER	12	4						3	60						512	N/A	N/A
119	BN HQ & CLASSROOM	HE2-PER	12	3				54.30			231		1		1	472	2,218	4.7	2.0
119	BN HQ & CLASSROOM	HV1	1	4						3	60						512	N/A	N/A
119	BN HQ & CLASSROOM	HV1	1	1		8,501.70		196.20			1,300	1	1	1	1	604	11,951	19.8	0.5
119	BN HQ & CLASSROOM	HV1	1	3				15.20			65		1		1	363	621	1.7	5.6
119	BN HQ & CLASSROOM	HV2	1	4						3	60						512	N/A	N/A
119	BN HQ & CLASSROOM	HV2	1	1		4,791.40		37.40			421	1	1	1	1	604	3,747	6.2	1.4
119	BN HQ & CLASSROOM	HV2	1	3				2.90			12		1		1	363	118	0.3	29.4
173	BARRACKS	B-3	10	7				44.20			188				2	602	1,805	3.0	3.2
173	BARRACKS	B-3	10	4						3	60						512	N/A	N/A
173	BARRACKS	FTR-1	12	4						3	60						512	N/A	N/A
174	CO HQ	AHU1	1	1		8,502.00		343.20			1,925	1	1	1	1	604	17,955	29.7	0.3
174	CO HQ	AHU1	1	3				26.60			113		1		1	363	1,086	3.0	3.2
174	CO HQ	AHU1	1	4						3	60						512	N/A	N/A
174	CO HQ	AHU2	1	4						3	60						512	N/A	N/A
174	CO HQ	AHU2	1	3				5.10			22		1		1	363	208	0.6	16.7
174	CO HQ	AHU2	1	1		4,791.40		65.40			540	1	1	1	1	604	4,891	8.1	1.1
174	CO HQ	HE1	9	4						3	60						512	N/A	N/A
174	CO HQ	HE1	9	7				1.90			8		1		2	773	78	0.1	95.6
174	CO HQ	HE1	9	3				25.30			108						1,033	N/A	N/A
174	CO HQ	HE1	9	1		5,328.60		326.80			1,682	1		1		289	15,815	54.7	0.2
174	CO HQ	HE2-PER	12	1		2,397.80		1,225.60			5,345	1		1	2	576	51,162	88.8	0.1
174	CO HQ	HE2-PER	12	3				95.00			404		1		1	472	3,880	8.2	1.2
174	CO HQ	HE2-PER	12	4						3	60						512	N/A	N/A
175	BRKS & MESS HALL	AHU1	1	1		12,801.70	174.40				1,469	1	1	1	1	604	12,707	21.0	0.4
175	BRKS & MESS HALL	AHU1	1	3			63.00				278		1		1	363	2,448	6.7	1.3
175	BRKS & MESS HALL	AHU1	1	4						3	60						512	N/A	N/A
175	BRKS & MESS HALL	AHU2	2	3			112.10				494		1		1	363	4,355	12.0	0.7
175	BRKS & MESS HALL	AHU2	2	1		15,122.30	310.30				2,196	1	1	2	1	756	19,062	25.2	0.3
175	BRKS & MESS HALL	AHU2	2	4						3	60						512	N/A	N/A
175	BRKS & MESS HALL	AHU3	2	4						3	60						512	N/A	N/A
175	BRKS & MESS HALL	AHU3	2	1		18,308.00	273.80				2,209	1	1	2	1	756	19,120	25.3	0.3
175	BRKS & MESS HALL	AHU3	2	3			98.90				436		1		1	363	3,842	10.6	0.8
175	BRKS & MESS HALL	AHU4	2	1		27,177.00	438.10				3,419	1	1	2	1	756	29,612	39.2	0.2
175	BRKS & MESS HALL	AHU4	2	3			158.30				698		1		1	363	6,150	16.9	0.5
175	BRKS & MESS HALL	AHU4	2	4						3	60						512	N/A	N/A
175	BRKS & MESS HALL	AHU5	2	1		11,550.20	182.50				1,437	1	1	2	1	756	12,442	16.5	0.5
175	BRKS & MESS HALL	AHU5	2	3			66.00				291		1		1	363	2,564	7.1	1.2
175	BRKS & MESS HALL	AHU5	2	4						3	60						512	N/A	N/A
175	BRKS & MESS HALL	AHU6	1	1		7,181.90	27.70				515	1	1	1	1	604	4,404	7.3	1.2
175	BRKS & MESS HALL	AHU6	1	4						3	60						512	N/A	N/A
175	BRKS & MESS HALL	AHU6	1	3			10.00				44		1		1	363	389	1.1	8.2
175	BRKS & MESS HALL	FTR1	12	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
175	BRKS & MESS HALL	HE1	9	7			11.10				49		1		2	773	431	0.6	15.8
175	BRKS & MESS HALL	HE1	9	1		3,637.00	135.10				795	1		1		289	6,934	24.0	0.4
175	BRKS & MESS HALL	HE1	9	4						3	60						512	N/A	N/A
175	BRKS & MESS HALL	HE1	9	3			48.80				215						1,896	N/A	N/A
176	ELEC SUBSTATION	ELEC												1		100			N/A
1240	TOE MAINT	B1	10	4						3	60						512	N/A	N/A
1240	TOE MAINT	B1	10	1		287.50		88.80			393	1		2		383	3,760	9.8	1.0
1240	TOE MAINT	B2	10	1		287.50		88.80			393	1		2		383	3,760	9.8	1.0
1240	TOE MAINT	B2	10	4						3	60						512	N/A	N/A
1240	TOE MAINT	HV1	1	1		162.00		2,190.40			9,327	1	1	1	1	604	89,527	148.2	0.1
1240	TOE MAINT	HV1	1	4						3	60						512	N/A	N/A
1240	TOE MAINT	HV1	1	3				76.40			325		1		1	363	3,120	8.6	1.1
1750	MOTOR REPAIR SHOP	B-1	10	1		21,339.80					1,167	1		2		383	9,887	25.8	0.3
1750	MOTOR REPAIR SHOP	B-1	10	4						3	60						512	N/A	N/A
1750	MOTOR REPAIR SHOP	B-1	10	7				12.80			54				2	602	523	0.9	11.1
1750	MOTOR REPAIR SHOP	FTR-1	12	1				168.10			715	1		1	2	576	6,865	11.9	0.8
1750	MOTOR REPAIR SHOP	FTR-1	12	4						3	60						512	N/A	N/A
1750	MOTOR REPAIR SHOP	FTR-1	12	3				5.90			25		1		1	472	241	0.5	18.8
1750	MOTOR REPAIR SHOP	HV-1	1	3				16.00			68		1		1	363	653	1.8	5.3
1750	MOTOR REPAIR SHOP	HV-1	1	1		34,135.30		459.60			3,822	1	1	1	1	604	34,585	57.3	0.2
1750	MOTOR REPAIR SHOP	HV-1	1	4						3	60						512	N/A	N/A
1750	MOTOR REPAIR SHOP	HV-2	1	3				9.50			40		1		1	363	388	1.1	9.0
1750	MOTOR REPAIR SHOP	HV-2	1	1		9,697.90		272.00			1,688	1	1	1	1	604	15,601	25.8	0.4
1750	MOTOR REPAIR SHOP	HV-2	1	4						3	60						512	N/A	N/A
1750	MOTOR REPAIR SHOP	HV-3	1	4						3	60						512	N/A	N/A
1750	MOTOR REPAIR SHOP	HV-3	1	3				37.60			160		1		1	363	1,536	4.2	2.3
1750	MOTOR REPAIR SHOP	HV-3	1	1		8,198.40		1,078.40			5,036	1	1	1	1	604	47,839	79.2	0.1
1750	MOTOR REPAIR SHOP	HV-4	1	3				7.80			33		1		1	363	319	0.9	10.9
1750	MOTOR REPAIR SHOP	HV-4	1	4						3	60						512	N/A	N/A
1750	MOTOR REPAIR SHOP	HV-4	1	1		8,198.40		222.20			1,394	1	1	1	1	604	12,873	21.3	0.4
2049	WSAAF HANGAR	B-1	10	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	B-1	10	7				44.40			189				2	602	1,813	3.0	3.2
2049	WSAAF HANGAR	B-2	10	7				44.40			189				2	602	1,813	3.0	3.2
2049	WSAAF HANGAR	B-2	10	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	FTR-1	10	3				11.40			48						466	N/A	N/A
2049	WSAAF HANGAR	FTR-1	10	1		15,149.40		59.80			1,083	1		2		383	9,461	24.7	0.4
2049	WSAAF HANGAR	FTR-1	10	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	HV-1	2	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	HV-1	2	1		1,633.70		142.30			695	1	1	2	1	756	6,568	8.7	1.1
2049	WSAAF HANGAR	HV-2	2	1		1,307.00		100.00			497	1	1	2	1	756	4,689	6.2	1.5
2049	WSAAF HANGAR	HV-2	2	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	HV-3	2	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	HV-3	2	1		1,633.70		142.30			695	1	1	2	1	756	6,568	8.7	1.1
2049	WSAAF HANGAR	HV-4	2	3				25.90			110		1		1	363	1,058	2.9	3.3
2049	WSAAF HANGAR	HV-4	2	1		28,521.20		135.80			2,138	1	1	2	1	756	18,760	24.8	0.4
2049	WSAAF HANGAR	HV-4	2	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	HV-5	2	3				3.50			15		1		1	363	143	0.4	24.4
2049	WSAAF HANGAR	HV-5	2	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	HV-5	2	1		12,000.60		18.10			733	1	1	2	1	756	6,299	8.3	1.0
2049	WSAAF HANGAR	HV-6	2	3				21.80			93		1		1	363	890	2.5	3.9
2049	WSAAF HANGAR	HV-6	2	1		19,363.70		114.50			1,546	1	1	2	1	756	13,647	18.1	0.5

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
2049	WSAAF HANGAR	HV-6	2	4						3	60						512	N/A	N/A
2049	WSAAF HANGAR	HV-7	2	1		19,363.70		99.10			1,481	1	1	2	1	756	13,018	17.2	0.5
2049	WSAAF HANGAR	HV-7	2	3				18.90			80		1		1	363	772	2.1	4.5
2049	WSAAF HANGAR	HV-7	2	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	B-1	10	7				44.40			189				2	602	1,813	3.0	3.2
2050	MNT HANGER AVUM	B-1	10	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	B-2	10	7				44.40			189				2	602	1,813	3.0	3.2
2050	MNT HANGER AVUM	B-2	10	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	FTR-1	10	3				11.50			49						470	N/A	N/A
2050	MNT HANGER AVUM	FTR-1	10	1		15,149.40		60.50			1,086	1		2		383	9,490	24.8	0.4
2050	MNT HANGER AVUM	FTR-1	10	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	HV-1	2	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	HV-1	2	1		1,633.70		142.30			695	1	1	2	1	756	6,568	8.7	1.1
2050	MNT HANGER AVUM	HV-2	2	1		1,307.00		100.00			497	1	1	2	1	756	4,689	6.2	1.5
2050	MNT HANGER AVUM	HV-2	2	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	HV-3	2	1		1,633.70		142.30			695	1	1	2	1	756	6,568	8.7	1.1
2050	MNT HANGER AVUM	HV-3	2	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	HV-4	2	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	HV-4	2	1		28,521.20		137.40			2,145	1	1	2	1	756	18,825	24.9	0.4
2050	MNT HANGER AVUM	HV-4	2	3				26.20			111		1		1	363	1,070	2.9	3.3
2050	MNT HANGER AVUM	HV-5	2	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	HV-5	2	3				3.50			15		1		1	363	143	0.4	24.4
2050	MNT HANGER AVUM	HV-5	2	1		12,000.60		18.30			734	1	1	2	1	756	6,307	8.3	1.0
2050	MNT HANGER AVUM	HV-6	2	1		19,363.70		115.80			1,552	1	1	2	1	756	13,700	18.1	0.5
2050	MNT HANGER AVUM	HV-6	2	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	HV-6	2	3				22.10			94		1		1	363	903	2.5	3.9
2050	MNT HANGER AVUM	HV-7	2	3				19.10			81		1		1	363	780	2.1	4.5
2050	MNT HANGER AVUM	HV-7	2	4						3	60						512	N/A	N/A
2050	MNT HANGER AVUM	HV-7	2	1		19,363.70		100.30			1,486	1	1	2	1	756	13,067	17.3	0.5
2060	MNT HANGER AVUM	B-1	10	7				35.50			151				2	602	1,450	2.4	4.0
2060	MNT HANGER AVUM	B-1	10	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	B-2	10	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	B-2	10	7				35.50			151				2	602	1,450	2.4	4.0
2060	MNT HANGER AVUM	FTR-1	12	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	FTR-1	12	3				6.80			29		1		1	472	278	0.6	16.3
2060	MNT HANGER AVUM	HV-1	1	3				41.60			177		1		1	363	1,699	4.7	2.1
2060	MNT HANGER AVUM	HV-1	1	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	MAU-1	2	1		1,079.50		74.10			374	1	1	2	1	756	3,526	4.7	2.0
2060	MNT HANGER AVUM	MAU-1	2	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	RMAU-1	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2060	MNT HANGER AVUM	RMAU-1	2	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	RMAU-2	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2060	MNT HANGER AVUM	RMAU-2	2	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	RMAU-3	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2060	MNT HANGER AVUM	RMAU-3	2	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	RMAU-4	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2060	MNT HANGER AVUM	RMAU-4	2	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	RMAU-5	2	4						3	60						512	N/A	N/A
2060	MNT HANGER AVUM	RMAU-5	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2060	MNT HANGER AVUM	RMAU-6	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2060	MNT HANGER AVUM	RMAU-6	2	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
2065	AF OPS BLDG	AC-1	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-1	3	1	7.3						50	1	1	1	1	604	428	0.7	12.0
2065	AF OPS BLDG	AC-2	3	1	7.3						50	1	1	1	1	604	428	0.7	12.0
2065	AF OPS BLDG	AC-2	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-4	3	1	7.3						50	1	1	1	1	604	428	0.7	12.0
2065	AF OPS BLDG	AC-4	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-4A	3	1	7.3						50	1	1	1	1	604	428	0.7	12.0
2065	AF OPS BLDG	AC-4A	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-5	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-5	3	1	7.3						50	1	1	1	1	604	428	0.7	12.0
2065	AF OPS BLDG	AC-6	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-6	3	1	27.1						186	1	1	1	1	604	1,590	2.6	3.2
2065	AF OPS BLDG	AC-7	3	1	27.1						186	1	1	1	1	604	1,590	2.6	3.2
2065	AF OPS BLDG	AC-7	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-8	3	1	7.3						50	1	1	1	1	604	428	0.7	12.0
2065	AF OPS BLDG	AC-8	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-9	3	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	AC-9	3	1	10.8						74	1	1	1	1	604	634	1.0	8.1
2065	AF OPS BLDG	ACC-1	11	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	ACC-1	11	1	1.4						10	1		1		289	82	0.3	30.0
2065	AF OPS BLDG	ACC-2	11	1	1.4						10	1		1		289	82	0.3	30.0
2065	AF OPS BLDG	ACC-2	11	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	ACC-3	11	1	1.4						10	1		1		289	82	0.3	30.0
2065	AF OPS BLDG	ACC-3	11	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	ACC-4	11	1	1.4						10	1		1		289	82	0.3	30.0
2065	AF OPS BLDG	ACC-4	11	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	ACC-5	11	1	1.4						10	1		1		289	82	0.3	30.0
2065	AF OPS BLDG	ACC-5	11	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	ACC-6	11	1	1.4						10	1		1		289	82	0.3	30.0
2065	AF OPS BLDG	ACC-6	11	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	ACC-7	11	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	ACC-7	11	1	1.4						10	1		1		289	82	0.3	30.0
2065	AF OPS BLDG	B-1	10	7				9.30			40				2	602	380	0.6	15.2
2065	AF OPS BLDG	B-1	10	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	B-2	10	7				9.30			40				2	602	380	0.6	15.2
2065	AF OPS BLDG	B-2	10	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	HV-1	2	3				14.90			63		1		1	363	608	1.7	5.7
2065	AF OPS BLDG	HV-1	2	1		287.50		124.50			545	1	1	2	1	756	5,218	6.9	1.4
2065	AF OPS BLDG	HV-1	2	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	HV-2	2	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	HV-2	2	3				44.30			188		1		1	363	1,809	5.0	1.9
2065	AF OPS BLDG	HV-2	2	1		1,012.10		369.40			1,627	1	1	2	1	756	15,555	20.6	0.5
2065	AF OPS BLDG	HV-3	2	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	HV-3	2	1		20,316.60		79.90			1,451	1	1	2	1	756	12,676	16.8	0.5
2065	AF OPS BLDG	HV-3	2	3				21.30			91		1		1	363	870	2.4	4.0
2065	AF OPS BLDG	HV-4	2	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	HV-4	2	1		687.10		169.50			759	1	1	2	1	756	7,240	9.6	1.0
2065	AF OPS BLDG	HV-4	2	3				20.40			87		1		1	363	833	2.3	4.2
2065	AF OPS BLDG	HX-1	12	7				8.10			34						331	N/A	N/A
2065	AF OPS BLDG	HX-1	12	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	HX-1	12	3				124.90			531		1		1	472	5,101	10.8	0.9

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
2065	AF OPS BLDG	MU-1	1	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	MU-1	1	3				61.00			259		1		1	363	2,491	6.9	1.4
2065	AF OPS BLDG	MU-2	1	4						3	60						512	N/A	N/A
2065	AF OPS BLDG	MU-2	1	3				258.00			1,098		1		1	363	10,536	29.0	0.3
2070	MNT HANGER AVUM	B-1	10	1		15,149.40					829	1		2		383	7,019	18.3	0.5
2070	MNT HANGER AVUM	B-1	10	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	B-1	10	7				49.50			211				2	602	2,022	3.4	2.9
2070	MNT HANGER AVUM	B-2	10	7				49.50			211				2	602	2,022	3.4	2.9
2070	MNT HANGER AVUM	B-2	10	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	HV-1	1	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	HV-1	1	1		54,673.90		1,519.50			9,455	1	1	1	1	604	87,385	144.7	0.1
2070	MNT HANGER AVUM	HV-1	1	3				303.30			1,290		1		1	363	12,386	34.1	0.3
2070	MNT HANGER AVUM	HV-2	1	3				117.70			501		1		1	363	4,807	13.2	0.7
2070	MNT HANGER AVUM	HV-2	1	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	HV-2	1	1		19,363.70		617.90			3,688	1	1	1	1	604	34,205	56.6	0.2
2070	MNT HANGER AVUM	HV-3	1	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	HV-3	1	3				30.90			131		1		1	363	1,262	3.5	2.8
2070	MNT HANGER AVUM	HV-3	1	1		3,646.30		161.90			888	1	1	1	1	604	8,301	13.7	0.7
2070	MNT HANGER AVUM	MAU-1	2	1		1,633.70		260.00			1,195	1	1	2	1	756	11,375	15.0	0.6
2070	MNT HANGER AVUM	MAU-1	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	MAU-2	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	MAU-2	2	1		1,940.10		245.20			1,149	1	1	2	1	756	10,912	14.4	0.7
2070	MNT HANGER AVUM	RMAU-1	2	1		1,940.10		178.80			867	1	1	2	1	756	8,201	10.8	0.9
2070	MNT HANGER AVUM	RMAU-1	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	RMAU-2	2	1		1,940.10		177.50			861	1	1	2	1	756	8,148	10.8	0.9
2070	MNT HANGER AVUM	RMAU-2	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	RMAU-3	2	1		1,940.10		177.50			861	1	1	2	1	756	8,148	10.8	0.9
2070	MNT HANGER AVUM	RMAU-3	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	RMAU-4	2	1		1,940.10		177.50			861	1	1	2	1	756	8,148	10.8	0.9
2070	MNT HANGER AVUM	RMAU-4	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	RMAU-5	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	RMAU-5	2	1		1,940.10		177.50			861	1	1	2	1	756	8,148	10.8	0.9
2070	MNT HANGER AVUM	RMAU-6	2	1		1,940.10		177.50			861	1	1	2	1	756	8,148	10.8	0.9
2070	MNT HANGER AVUM	RMAU-6	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	RMAU-7	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	RMAU-7	2	1		1,940.10		177.50			861	1	1	2	1	756	8,148	10.8	0.9
2070	MNT HANGER AVUM	RMAU-8	2	4						3	60						512	N/A	N/A
2070	MNT HANGER AVUM	RMAU-8	2	1		1,940.10		178.80			867	1	1	2	1	756	8,201	10.8	0.9
2072	MNT HANGER AVUM	B-1	10	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	B-1	10	7				44.40			189				2	602	1,813	3.0	3.2
2072	MNT HANGER AVUM	B-2	10	7				44.40			189				2	602	1,813	3.0	3.2
2072	MNT HANGER AVUM	B-2	10	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	FTR-1	12	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	FTR-1	12	3				35.10			149		1		1	472	1,433	3.0	3.2
2072	MNT HANGER AVUM	FTR-1	12	1		15,149.40					829	1		1	2	576	7,019	12.2	0.7
2072	MNT HANGER AVUM	HV-1	1	3				34.50			147		1		1	363	1,409	3.9	2.5
2072	MNT HANGER AVUM	HV-1	1	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	HV-1	1	1		28,521.20		181.20			2,331	1	1	1	1	604	20,614	34.1	0.3
2072	MNT HANGER AVUM	MAU-1	2	1		1,079.50		74.10			374	1	1	2	1	756	3,526	4.7	2.0
2072	MNT HANGER AVUM	MAU-1	2	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	RMAU-1	2	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
2072	MNT HANGER AVUM	RMAU-1	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2072	MNT HANGER AVUM	RMAU-2	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2072	MNT HANGER AVUM	RMAU-2	2	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	RMAU-3	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2072	MNT HANGER AVUM	RMAU-3	2	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	RMAU-4	2	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	RMAU-4	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2072	MNT HANGER AVUM	RMAU-5	2	4						3	60						512	N/A	N/A
2072	MNT HANGER AVUM	RMAU-5	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2072	MNT HANGER AVUM	RMAU-6	2	1		1,940.10		133.30			673	1	1	2	1	756	6,343	8.4	1.1
2072	MNT HANGER AVUM	RMAU-6	2	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	B-1	10	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	B-1	10	7				44.40			189				2	602	1,813	3.0	3.2
2074	MNT HANGER AVUM	B-2	10	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	B-2	10	7				44.40			189				2	602	1,813	3.0	3.2
2074	MNT HANGER AVUM	FTR-1	12	3				11.40			48		1		1	472	466	1.0	9.7
2074	MNT HANGER AVUM	FTR-1	12	1		15,149.40		59.80			1,083	1		1	2	576	9,461	16.4	0.5
2074	MNT HANGER AVUM	FTR-1	12	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	HV-1	2	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	HV-1	2	1		1,633.70		142.30			695	1	1	2	1	756	6,568	8.7	1.1
2074	MNT HANGER AVUM	HV-2	2	1		1,307.00		100.00			497	1	1	2	1	756	4,689	6.2	1.5
2074	MNT HANGER AVUM	HV-2	2	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	HV-3	2	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	HV-3	2	1		1,633.70		142.30			695	1	1	2	1	756	6,568	8.7	1.1
2074	MNT HANGER AVUM	HV-4	2	1		28,521.20		138.80			2,151	1	1	2	1	756	18,882	25.0	0.4
2074	MNT HANGER AVUM	HV-4	2	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	HV-4	2	3				26.40			112		1		1	363	1,078	3.0	3.2
2074	MNT HANGER AVUM	HV-5	2	1		12,000.60		185.00			1,443	1	1	2	1	756	13,115	17.3	0.5
2074	MNT HANGER AVUM	HV-5	2	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	HV-5	2	3				35.30			150		1		1	363	1,442	4.0	2.4
2074	MNT HANGER AVUM	HV-6	2	4						3	60						512	N/A	N/A
2074	MNT HANGER AVUM	HV-6	2	1		19,363.70		117.00			1,557	1	1	2	1	756	13,749	18.2	0.5
2074	MNT HANGER AVUM	HV-6	2	3				22.30			95		1		1	363	911	2.5	3.8
2074	MNT HANGER AVUM	HV-7	2	3				19.30			82		1		1	363	788	2.2	4.4
2074	MNT HANGER AVUM	HV-7	2	1		19,363.70		101.20			1,490	1	1	2	1	756	13,104	17.3	0.5
2074	MNT HANGER AVUM	HV-7	2	4						3	60						512	N/A	N/A
2792	AMMO INSPECTION	B-1	10	7			4.30				19				2	602	167	0.3	31.7
2792	AMMO INSPECTION	B-1	10	4						3	60						512	N/A	N/A
2792	AMMO INSPECTION	HV-1	1	3			9.70				43		1		1	363	377	1.0	8.5
2792	AMMO INSPECTION	HV-1	1	4						3	60						512	N/A	N/A
2792	AMMO INSPECTION	HV-1	1	1		1,186.90	277.90				1,290	1	1	1	1	604	11,347	18.8	0.5
4230	MINI MALL W/GAS	AH1	7	4						6	120						1,024	N/A	N/A
4230	MINI MALL W/GAS	AH1	7	3		3,639.00	173.50				964		3		2	1,007	8,427	8.4	1.0
4230	MINI MALL W/GAS	AH1	7	2		773.80					42		1		2	647	359	0.6	15.3
4230	MINI MALL W/GAS	AH1	7	1		19,438.90					1,063	2		2	2	843	9,006	10.7	0.8
4230	MINI MALL W/GAS	AH2	7	2		486.80					27		1		2	647	226	0.3	24.3
4230	MINI MALL W/GAS	AH2	7	1		25,270.50					1,382	2		2	2	843	11,708	13.9	0.6
4230	MINI MALL W/GAS	AH2	7	3		2,289.00	57.80				380		3		2	1,007	3,306	3.3	2.6
4230	MINI MALL W/GAS	AH2	7	4						6	120						1,024	N/A	N/A
4230	MINI MALL W/GAS	B1	10	1		2,246.00					123	1		2		383	1,041	2.7	3.1
4230	MINI MALL W/GAS	B1	10	7			7.00				31				2	602	272	0.5	19.5

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4230	MINI MALL W/GAS	B1	10	4						3	60						512	N/A	N/A
4230	MINI MALL W/GAS	B2	10	1		2,246.00					123	1		2		383	1,041	2.7	3.1
4230	MINI MALL W/GAS	B2	10	4						3	60						512	N/A	N/A
4230	MINI MALL W/GAS	B2	10	7			7.00				31				2	602	272	0.5	19.5
4305	PHYS FITNESS CENTER	B-1	10	7				12.10			51				2	602	494	0.8	11.7
4305	PHYS FITNESS CENTER	B-1	10	4						3	60						512	N/A	N/A
4305	PHYS FITNESS CENTER	B-2	10	7				24.20			103				2	602	988	1.6	5.8
4305	PHYS FITNESS CENTER	B-2	10	1		4,839.10					265	1		2		383	2,242	5.9	1.4
4305	PHYS FITNESS CENTER	B-2	10	4						3	60						512	N/A	N/A
4305	PHYS FITNESS CENTER	FTR-1	12	1				27.80			118	1		1	2	576	1,135	2.0	4.9
4305	PHYS FITNESS CENTER	FTR-1	12	3				5.00			21		1		1	472	204	0.4	22.2
4305	PHYS FITNESS CENTER	FTR-1	12	4						3	60						512	N/A	N/A
4305	PHYS FITNESS CENTER	HV-1	2	4						3	60						512	N/A	N/A
4305	PHYS FITNESS CENTER	HV-1	2	3				273.00			1,161		1		1	363	11,149	30.7	0.3
4305	PHYS FITNESS CENTER	HV-1	2	1		212,978.90		1,513.00			18,086	1	1	2	1	756	160,464	212.3	0.0
4305	PHYS FITNESS CENTER	HV-3	2	1		23,934.00		128.70			1,857	1	1	2	1	756	16,345	21.6	0.4
4305	PHYS FITNESS CENTER	HV-3	2	4						3	60						512	N/A	N/A
4305	PHYS FITNESS CENTER	HV-3	2	3				23.20			99		1		1	363	947	2.6	3.7
4325	SKILL DEV CENTER	HV-1	1	3			143.70				634		1		1	363	5,583	15.4	0.6
4325	SKILL DEV CENTER	HV-1	1	4						3	60						512	N/A	N/A
4325	SKILL DEV CENTER	HV-1	1	1		8,103.00	552.10				2,878	1	1	1	1	604	25,204	41.7	0.2
4325	SKILL DEV CENTER	HV-2	1	3			100.60				444		1		1	363	3,909	10.8	0.8
4325	SKILL DEV CENTER	HV-2	1	4						3	60						512	N/A	N/A
4325	SKILL DEV CENTER	HV-2	1	1		6,850.00	386.50				2,079	1	1	1	1	604	18,190	30.1	0.3
4325	SKILL DEV CENTER	HV-3	1	3			98.80				436		1		1	363	3,839	10.6	0.8
4325	SKILL DEV CENTER	HV-3	1	4						3	60						512	N/A	N/A
4325	SKILL DEV CENTER	HV-3	1	1		6,850.00	379.60				2,049	1	1	1	1	604	17,922	29.7	0.3
4325	SKILL DEV CENTER	HV-4	1	4						3	60						512	N/A	N/A
4325	SKILL DEV CENTER	HV-4	1	1		6,850.00	379.60				2,049	1	1	1	1	604	17,922	29.7	0.3
4325	SKILL DEV CENTER	HV-4	1	3			98.80				436		1		1	363	3,839	10.6	0.8
4325	SKILL DEV CENTER	HX-1	12	7			15.90				70						618	N/A	N/A
4325	SKILL DEV CENTER	HX-1	12	1		4,300.80	552.80				2,673	1		1	2	576	23,470	40.7	0.2
4325	SKILL DEV CENTER	HX-1	12	4						3	60						512	N/A	N/A
4325	SKILL DEV CENTER	HX-1	12	3			143.90				635		1		1	472	5,591	11.8	0.7
4330	RECREATION CNTR	AHU1	3	3				105.70			450		2		1	534	4,317	8.1	1.2
4330	RECREATION CNTR	AHU1	3	4						3	60						512	N/A	N/A
4330	RECREATION CNTR	AHU1	3	1		44,359.10		60.60			2,684	1	1	1	1	604	23,027	38.1	0.2
4330	RECREATION CNTR	B1	10	1		4,433.60		13.30			299	1		2		383	2,597	6.8	1.3
4330	RECREATION CNTR	B1	10	4						3	60						512	N/A	N/A
4330	RECREATION CNTR	B1	10	7				8.60			37				2	602	351	0.6	16.5
4350	OPEN DIN NCO	AHU1	1	4						3	60						512	N/A	N/A
4350	OPEN DIN NCO	AHU1	1	3			79.50				351		1		1	363	3,089	8.5	1.0
4350	OPEN DIN NCO	AHU1	1	1		12,801.70	220.00				1,670	1	1	1	1	604	14,479	24.0	0.4
4350	OPEN DIN NCO	AHU2	2	3			76.80				339		1		1	363	2,984	8.2	1.1
4350	OPEN DIN NCO	AHU2	2	1		13,655.20	212.50				1,684	1	1	2	1	756	14,583	19.3	0.4
4350	OPEN DIN NCO	AHU2	2	4						3	60						512	N/A	N/A
4350	OPEN DIN NCO	AHU3	2	4						3	60						512	N/A	N/A
4350	OPEN DIN NCO	AHU3	2	1		16,531.00	187.50				1,731	1	1	2	1	756	14,944	19.8	0.4
4350	OPEN DIN NCO	AHU3	2	3			67.70				299		1		1	363	2,630	7.2	1.2
4350	OPEN DIN NCO	AHU4	2	3			108.40				478		1		1	363	4,212	11.6	0.8
4350	OPEN DIN NCO	AHU4	2	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4350	OPEN DIN NCO	AHU4	2	1		24,540.00	300.00				2,665	1	1	2	1	756	23,025	30.5	0.3
4350	OPEN DIN NCO	AHU5	2	4						3	60						512	N/A	N/A
4350	OPEN DIN NCO	AHU5	2	3			45.20				199		1		1	363	1,756	4.8	1.8
4350	OPEN DIN NCO	AHU5	2	1		10,429.60	125.00				1,122	1	1	2	1	756	9,689	12.8	0.7
4350	OPEN DIN NCO	AHU6	1	4						3	60						512	N/A	N/A
4350	OPEN DIN NCO	AHU6	1	3			7.20				32		1		1	363	280	0.8	11.4
4350	OPEN DIN NCO	AHU6	1	1		7,181.90	20.00				481	1	1	1	1	604	4,104	6.8	1.3
4350	OPEN DIN NCO	HE1	9	4						3	60						512	N/A	N/A
4350	OPEN DIN NCO	HE1	9	1		2,343.10	92.50				536	1		1		289	4,679	16.2	0.5
4350	OPEN DIN NCO	HE1	9	3			33.40				147						1,298	N/A	N/A
4350	OPEN DIN NCO	HE1	9	7			11.10				49		1		2	773	431	0.6	15.8
4400	RGT HQ BUILDING	AHU1	1	4						3	60						512	N/A	N/A
4400	RGT HQ BUILDING	AHU1	1	3			13.90				61		1		1	363	540	1.5	5.9
4400	RGT HQ BUILDING	AHU1	1	1		8,501.70	179.90				1,258	1	1	1	1	604	10,928	18.1	0.5
4400	RGT HQ BUILDING	AHU2	1	3			2.70				12		1		1	363	105	0.3	30.5
4400	RGT HQ BUILDING	AHU2	1	1		4,791.40	34.30				413	1	1	1	1	604	3,553	5.9	1.5
4400	RGT HQ BUILDING	AHU2	1	4						3	60						512	N/A	N/A
4400	RGT HQ BUILDING	HE1	9	4						3	60						512	N/A	N/A
4400	RGT HQ BUILDING	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
4400	RGT HQ BUILDING	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
4400	RGT HQ BUILDING	HE2-PER	12	3			49.80				220		1		1	472	1,935	4.1	2.1
4400	RGT HQ BUILDING	HE2-PER	12	1		2,397.80	642.40				2,964	1		1	2	576	26,070	45.3	0.2
4400	RGT HQ BUILDING	HE2-PER	12	4						3	60						512	N/A	N/A
4405	UNIT CHAPEL	AHU-1	2	4						3	60						512	N/A	N/A
4405	UNIT CHAPEL	AHU-1	2	1		97,058.70	390.10				7,029	1	1	2	1	756	60,124	79.5	0.1
4405	UNIT CHAPEL	AHU-1	2	3			9.60				42		1		1	363	373	1.0	8.6
4405	UNIT CHAPEL	AHU-2	2	4						3	60						512	N/A	N/A
4405	UNIT CHAPEL	AHU-2	2	1		52,521.50	196.90				3,741	1	1	2	1	756	31,984	42.3	0.2
4405	UNIT CHAPEL	AHU-2	2	3			68.40				302		1		1	363	2,657	7.3	1.2
4405	UNIT CHAPEL	FTR-1	12	3			25.30				112		1		1	472	983	2.1	4.2
4405	UNIT CHAPEL	FTR-1	12	4						3	60						512	N/A	N/A
4405	UNIT CHAPEL	FTR-1	12	1		4,888.10	66.20				559	1		1	2	576	4,837	8.4	1.0
4405	UNIT CHAPEL	HE-1	9	4						3	60						512	N/A	N/A
4405	UNIT CHAPEL	HE-1	9	7			3.70				16		1		2	773	144	0.2	47.4
4410	BN HQ BLDG	AHU1	1	1		8,501.70	168.40				1,208	1	1	1	1	604	10,482	17.4	0.5
4410	BN HQ BLDG	AHU1	1	3			13.10				58		1		1	363	509	1.4	6.3
4410	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
4410	BN HQ BLDG	AHU2	1	3			2.50				11		1		1	363	97	0.3	32.9
4410	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
4410	BN HQ BLDG	AHU2	1	1		4,791.40	32.10				404	1	1	1	1	604	3,467	5.7	1.5
4410	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
4410	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
4410	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
4410	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
4410	BN HQ BLDG	HE2-PER	12	3			46.60				206		1		1	472	1,811	3.8	2.3
4410	BN HQ BLDG	HE2-PER	12	1		2,397.80	601.40				2,783	1		1	2	576	24,477	42.5	0.2
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			79.20				349		1		1	363	3,077	8.5	1.0
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			79.20				349		1		1	363	3,077	8.5	1.0

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	108.10				569	1	1	1	1	604	4,980	8.2	1.1
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.00				57		1		1	363	505	1.4	6.3
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.00				57		1		1	363	505	1.4	6.3
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	108.10				569	1	1	1	1	604	4,980	8.2	1.1
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	108.10				569	1	1	1	1	604	4,980	8.2	1.1
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.00				57		1		1	363	505	1.4	6.3
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.00				57		1		1	363	505	1.4	6.3
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	108.10				569	1	1	1	1	604	4,980	8.2	1.1
4412	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
4412	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
4412	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
4412	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	72.80				413	1	1	1	1	604	3,608	6.0	1.5
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			8.70				38		1		1	363	338	0.9	9.5
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	72.80				413	1	1	1	1	604	3,608	6.0	1.5
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			8.70				38		1		1	363	338	0.9	9.5
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			8.70				38		1		1	363	338	0.9	9.5
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	72.80				413	1	1	1	1	604	3,608	6.0	1.5
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			62.90				277		1		1	363	2,444	6.7	1.3
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			62.90				277		1		1	363	2,444	6.7	1.3
4414	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
4414	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
4414	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
4414	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
4414	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
4414	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
4420	BN HQ BLDG	AHU1	1	1		8,501.70	170.60				1,217	1	1	1	1	604	10,567	17.5	0.5
4420	BN HQ BLDG	AHU1	1	3			13.20				58		1		1	363	513	1.4	6.2
4420	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
4420	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
4420	BN HQ BLDG	AHU2	1	1		4,791.40	32.50				405	1	1	1	1	604	3,483	5.8	1.5
4420	BN HQ BLDG	AHU2	1	3			2.50				11		1		1	363	97	0.3	32.9
4420	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
4420	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
4420	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4420	BN HQ BLDG	HE2-PER	12	1		2,397.80	609.40				2,819	1		1	2	576	24,787	43.0	0.2
4420	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
4420	BN HQ BLDG	HE2-PER	12	3			47.20				208		1		1	472	1,834	3.9	2.3
4422	ENL BK W/O DIN	HE-1	9	4						3	60						512	N/A	N/A
4422	ENL BK W/O DIN	HE-1	9	7			2.10				9		1		2	773	82	0.1	83.5
4422	ENL BK W/O DIN	HE-2	9	4						3	60						512	N/A	N/A
4422	ENL BK W/O DIN	HE-2	9	3			258.80				1,141						10,055	N/A	N/A
4422	ENL BK W/O DIN	HV-1	1	3			80.00				353		1		1	363	3,108	8.6	1.0
4422	ENL BK W/O DIN	HV-1	1	4						3	60						512	N/A	N/A
4422	ENL BK W/O DIN	HV-2	1	3			80.00				353		1		1	363	3,108	8.6	1.0
4422	ENL BK W/O DIN	HV-2	1	4						3	60						512	N/A	N/A
4430	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
4430	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
4430	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
4430	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
4430	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
4430	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
4430	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
4430	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
4430	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
4430	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
4430	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
4430	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
4432	ENL BK W/O DIN	FTR-1	9	4						3	60						512	N/A	N/A
4432	ENL BK W/O DIN	FTR-1	9	7			267.10				1,178		1		2	773	10,377	13.4	0.7
4432	ENL BK W/O DIN	HE-1	9	4						3	60						512	N/A	N/A
4432	ENL BK W/O DIN	HE-1	9	7			2.10				9		1		2	773	82	0.1	83.5
4432	ENL BK W/O DIN	HV-1	1	4						3	60						512	N/A	N/A
4432	ENL BK W/O DIN	HV-1	1	3			82.60				364		1		1	363	3,209	8.8	1.0
4432	ENL BK W/O DIN	HV-2	1	4						3	60						512	N/A	N/A
4432	ENL BK W/O DIN	HV-2	1	3			82.60				364		1		1	363	3,209	8.8	1.0
4450	ENL PERS DIN	AHU1	1	4						3	60						512	N/A	N/A
4450	ENL PERS DIN	AHU1	1	3			63.00				278		1		1	363	2,448	6.7	1.3
4450	ENL PERS DIN	AHU1	1	1		12,801.70	174.40				1,469	1	1	1	1	604	12,707	21.0	0.4
4450	ENL PERS DIN	AHU2	2	1		15,122.30	203.20				1,723	1	1	2	1	756	14,901	19.7	0.4
4450	ENL PERS DIN	AHU2	2	4						3	60						512	N/A	N/A
4450	ENL PERS DIN	AHU2	2	3			73.40				324		1		1	363	2,852	7.9	1.1
4450	ENL PERS DIN	AHU3	2	4						3	60						512	N/A	N/A
4450	ENL PERS DIN	AHU3	2	1		18,308.00	179.30				1,792	1	1	2	1	756	15,448	20.4	0.4
4450	ENL PERS DIN	AHU3	2	3			64.80				286		1		1	363	2,518	6.9	1.3
4450	ENL PERS DIN	AHU4	2	3			103.70				457		1		1	363	4,029	11.1	0.8
4450	ENL PERS DIN	AHU4	2	4						3	60						512	N/A	N/A
4450	ENL PERS DIN	AHU4	2	1		27,177.00	286.90				2,752	1	1	2	1	756	23,738	31.4	0.3
4450	ENL PERS DIN	AHU5	2	3			43.20				191		1		1	363	1,678	4.6	1.9
4450	ENL PERS DIN	AHU5	2	1		11,550.20	119.50				1,159	1	1	2	1	756	9,994	13.2	0.7
4450	ENL PERS DIN	AHU5	2	4						3	60						512	N/A	N/A
4450	ENL PERS DIN	AHU6	1	4						3	60						512	N/A	N/A
4450	ENL PERS DIN	AHU6	1	1		7,181.90	19.10				477	1	1	1	1	604	4,070	6.7	1.3
4450	ENL PERS DIN	AHU6	1	3			6.90				30		1		1	363	268	0.7	11.9
4450	ENL PERS DIN	HE1	9	4						3	60						512	N/A	N/A
4450	ENL PERS DIN	HE1	9	1		3,637.00	88.50				589	1		1		289	5,123	17.7	0.5

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4450	ENL PERS DIN	HE1	9	7			11.10				49		1		2	773	431	0.6	15.8
4450	ENL PERS DIN	HE1	9	3			32.00				141						1,243	N/A	N/A
4475	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	HTP1	12	1		12,616.70	194.80				1,549	1		1	2	576	13,414	23.3	0.4
4475	VEH MAINT SHOP	HTP1	12	3			49.80				220		1		1	472	1,935	4.1	2.1
4475	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
4475	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
4475	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
4475	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
4475	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	HV1	2	1		83,884.90	81.20				4,947	1	1	2	1	756	42,019	55.6	0.2
4475	VEH MAINT SHOP	HV1	2	3			20.70				91		1		1	363	804	2.2	4.0
4475	VEH MAINT SHOP	HV2	2	3			20.70				91		1		1	363	804	2.2	4.0
4475	VEH MAINT SHOP	HV2	2	1		101,035.00	81.20				5,885	1	1	2	1	756	49,965	66.1	0.1
4475	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	HV3	2	1		83,884.90	81.20				4,947	1	1	2	1	756	42,019	55.6	0.2
4475	VEH MAINT SHOP	HV3	2	3			20.70				91		1		1	363	804	2.2	4.0
4475	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	HV4	2	3			10.40				46		1		1	363	404	1.1	7.9
4475	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	HV4	2	1		83,884.90	40.60				4,768	1	1	2	1	756	40,442	53.5	0.2
4475	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	MAU1	1	3			12.40				55		1		1	363	482	1.3	6.6
4475	VEH MAINT SHOP	MAU1	1	1		56,826.30	48.70				3,323	1	1	1	1	604	28,220	46.7	0.2
4475	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	MAU2	1	3			6.20				27		1		1	363	241	0.7	13.3
4475	VEH MAINT SHOP	MAU2	1	1		56,826.30	24.40				3,216	1	1	1	1	604	27,276	45.2	0.2
4475	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	MAU3	1	1		56,826.30	48.70				3,323	1	1	1	1	604	28,220	46.7	0.2
4475	VEH MAINT SHOP	MAU3	1	3			12.40				55		1		1	363	482	1.3	6.6
4475	VEH MAINT SHOP	MAU4	1	3			12.40				55		1		1	363	482	1.3	6.6
4475	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	MAU4	1	1		56,826.30	48.70				3,323	1	1	1	1	604	28,220	46.7	0.2
4475	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	MAU5	1	1		56,826.30	24.40				3,216	1	1	1	1	604	27,276	45.2	0.2
4475	VEH MAINT SHOP	MAU5	1	3			6.20				27		1		1	363	241	0.7	13.3
4475	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	MAU6	1	3			10.40				46		1		1	363	404	1.1	7.9
4475	VEH MAINT SHOP	MAU6	1	1		56,826.30	40.60				3,287	1	1	1	1	604	27,906	46.2	0.2
4475	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
4475	VEH MAINT SHOP	MAU7	1	1		56,826.00	16.20				3,180	1	1	1	1	604	26,957	44.6	0.2
4475	VEH MAINT SHOP	MAU7	1	3			4.10				18		1		1	363	159	0.4	20.1
4485	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	HTP1	12	3			21.40				94		1		1	472	831	1.8	5.0
4485	VEH MAINT SHOP	HTP1	12	1		12,616.70	83.80				1,060	1		1	2	576	9,101	15.8	0.5
4485	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
4485	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
4485	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4485	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
4485	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	HV1	2	3			8.90				39		1		1	363	346	1.0	9.2
4485	VEH MAINT SHOP	HV1	2	1		83,884.90	34.90				4,742	1	1	2	1	756	40,221	53.2	0.2
4485	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	HV2	2	1		101,035.00	34.90				5,681	1	1	2	1	756	48,166	63.7	0.1
4485	VEH MAINT SHOP	HV2	2	3			8.90				39		1		1	363	346	1.0	9.2
4485	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	HV3	2	1		83,884.90	34.90				4,742	1	1	2	1	756	40,221	53.2	0.2
4485	VEH MAINT SHOP	HV3	2	3			8.90				39		1		1	363	346	1.0	9.2
4485	VEH MAINT SHOP	HV4	2	1		83,884.90	17.50				4,666	1	1	2	1	756	39,545	52.3	0.2
4485	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	HV4	2	3			4.50				20		1		1	363	175	0.5	18.3
4485	VEH MAINT SHOP	MAU1	1	3			5.40				24		1		1	363	210	0.6	15.2
4485	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	MAU1	1	1		56,826.30	21.00				3,201	1	1	1	1	604	27,144	44.9	0.2
4485	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	MAU2	1	1		56,826.30	10.50				3,155	1	1	1	1	604	26,736	44.3	0.2
4485	VEH MAINT SHOP	MAU2	1	3			2.70				12		1		1	363	105	0.3	30.5
4485	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	MAU3	1	1		56,826.30	21.00				3,201	1	1	1	1	604	27,144	44.9	0.2
4485	VEH MAINT SHOP	MAU3	1	3			5.40				24		1		1	363	210	0.6	15.2
4485	VEH MAINT SHOP	MAU4	1	1		56,826.30	21.00				3,201	1	1	1	1	604	27,144	44.9	0.2
4485	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	MAU4	1	3			5.40				24		1		1	363	210	0.6	15.2
4485	VEH MAINT SHOP	MAU5	1	1		56,826.30	10.50				3,155	1	1	1	1	604	26,736	44.3	0.2
4485	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	MAU5	1	3			2.70				12		1		1	363	105	0.3	30.5
4485	VEH MAINT SHOP	MAU6	1	1		56,826.30	17.50				3,186	1	1	1	1	604	27,008	44.7	0.2
4485	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	MAU6	1	3			4.50				20		1		1	363	175	0.5	18.3
4485	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
4485	VEH MAINT SHOP	MAU7	1	1		29,644.00	7.00				1,652	1	1	1	1	604	14,006	23.2	0.4
4485	VEH MAINT SHOP	MAU7	1	3			1.80				8		1		1	363	70	0.2	45.7
4486	VEH MAINT SHOP	HTP1	12	3			15.70				69		1		1	472	610	1.3	6.8
4486	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	HTP1	12	1		12,616.70	61.60				962	1		1	2	576	8,239	14.3	0.6
4486	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
4486	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
4486	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
4486	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
4486	VEH MAINT SHOP	HV1	2	1		83,884.90	25.70				4,702	1	1	2	1	756	39,863	52.7	0.2
4486	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	HV1	2	3			6.60				29		1		1	363	256	0.7	12.5
4486	VEH MAINT SHOP	HV2	2	3			6.60				29		1		1	363	256	0.7	12.5
4486	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	HV2	2	1		101,035.00	25.70				5,640	1	1	2	1	756	47,809	63.2	0.1
4486	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4486	VEH MAINT SHOP	HV3	2	3			6.60				29		1		1	363	256	0.7	12.5
4486	VEH MAINT SHOP	HV3	2	1		83,884.90	25.70				4,702	1	1	2	1	756	39,863	52.7	0.2
4486	VEH MAINT SHOP	HV4	2	3			3.30				15		1		1	363	128	0.4	24.9
4486	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	HV4	2	1		83,884.90	12.80				4,645	1	1	2	1	756	39,362	52.1	0.2
4486	VEH MAINT SHOP	MAU1	1	1		56,826.30	15.40				3,176	1	1	1	1	604	26,926	44.6	0.2
4486	VEH MAINT SHOP	MAU1	1	3			3.90				17		1		1	363	152	0.4	21.1
4486	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	MAU2	1	1		56,826.30	7.70				3,142	1	1	1	1	604	26,627	44.1	0.2
4486	VEH MAINT SHOP	MAU2	1	3			2.00				9		1		1	363	78	0.2	41.2
4486	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	MAU3	1	3			3.90				17		1		1	363	152	0.4	21.1
4486	VEH MAINT SHOP	MAU3	1	1		56,826.30	15.40				3,176	1	1	1	1	604	26,926	44.6	0.2
4486	VEH MAINT SHOP	MAU4	1	3			3.90				17		1		1	363	152	0.4	21.1
4486	VEH MAINT SHOP	MAU4	1	1		56,826.30	15.40				3,176	1	1	1	1	604	26,926	44.6	0.2
4486	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	MAU5	1	1		56,826.30	7.70				3,142	1	1	1	1	604	26,627	44.1	0.2
4486	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	MAU5	1	3			2.00				9		1		1	363	78	0.2	41.2
4486	VEH MAINT SHOP	MAU6	1	1		56,826.30	12.80				3,165	1	1	1	1	604	26,825	44.4	0.2
4486	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	MAU6	1	3			3.30				15		1		1	363	128	0.4	24.9
4486	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
4486	VEH MAINT SHOP	MAU7	1	1		29,644.00	5.10				1,644	1	1	1	1	604	13,932	23.1	0.4
4486	VEH MAINT SHOP	MAU7	1	3			1.30				6		1		1	363	51	0.1	63.3
4525	DOL WAREHOUSE	AHU-1	2	1		19,364	230				2,075	1	1	2	1	756	17,923	23.7	0.4
4525	DOL WAREHOUSE	AHU-1	2	3			59				259		1		1	363	2,285	6.3	1.4
4525	DOL WAREHOUSE	AHU-1	2	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	AHU-2	2	1		16,001	152				1,545	1	1	2	1	756	13,315	17.6	0.5
4525	DOL WAREHOUSE	AHU-2	2	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	AHU-2	2	3			39				171		1		1	363	1,507	4.2	2.1
4525	DOL WAREHOUSE	AHU-3	2	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	AHU-3	2	3			9				40		1		1	363	354	1.0	9.0
4525	DOL WAREHOUSE	AHU-3	2	1		16,001	36				1,032	1	1	2	1	756	8,796	11.6	0.7
4525	DOL WAREHOUSE	AHU-4	1	1		8,103	7				474	1	1	1	1	604	4,026	6.7	1.3
4525	DOL WAREHOUSE	AHU-4	1	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	AHU-4	1	3			2				8		1		1	363	70	0.2	45.7
4525	DOL WAREHOUSE	AHU-5	1	3			1				6		1		1	363	54	0.1	58.8
4525	DOL WAREHOUSE	AHU-5	1	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	AHU-5	1	1		6,850	5				399	1	1	1	1	604	3,383	5.6	1.5
4525	DOL WAREHOUSE	AHU-6	1	1		6,850	4				393	1	1	1	1	604	3,337	5.5	1.5
4525	DOL WAREHOUSE	AHU-6	1	3			1				5		1		1	363	43	0.1	74.8
4525	DOL WAREHOUSE	AHU-7	1	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	AHU-7	1	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	AHU-7	1	1		12,001	14				719	1	1	1	1	604	6,108	10.1	0.8
4525	DOL WAREHOUSE	AHU-7	1	3			4				16		1		1	363	140	0.4	22.9
4525	DOL WAREHOUSE	HE-1	9	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	HE-1	9	7			10				44		1		2	773	389	0.5	17.5
4525	DOL WAREHOUSE	HE-2	9	7			9				39		1		2	773	346	0.4	19.7
4525	DOL WAREHOUSE	HE-2	9	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4525	DOL WAREHOUSE	HE-3	9	7			7				30		1		2	773	260	0.3	26.2
4525	DOL WAREHOUSE	HE-3	9	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	HE-4	9	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	HE-4	9	7			8				37		1		2	773	326	0.4	20.9
4525	DOL WAREHOUSE	MAU-1	1	3			15				65		1		1	363	571	1.6	5.6
4525	DOL WAREHOUSE	MAU-1	1	4						3	60						512	N/A	N/A
4525	DOL WAREHOUSE	MAU-1	1	1		19,364	58				1,313	1	1	1	1	604	11,209	18.6	0.5
4525	DOL WAREHOUSE	MAU-2	1	3			9				39		1		1	363	342	0.9	9.4
4525	DOL WAREHOUSE	MAU-2	1	1		2,431	35				286	1	1	1	1	604	2,471	4.1	2.1
4525	DOL WAREHOUSE	MAU-2	1	4						3	60						512	N/A	N/A
4530	SMA BUILDING	AC-1	4	1	2.60	5,906.20	110.50				828	1		2	1	584	7,182	12.3	0.7
4530	SMA BUILDING	AC-1	4	3			7.90				35		2		1	534	307	0.6	15.3
4530	SMA BUILDING	AC-1	4	4						3	60						512	N/A	N/A
4530	SMA BUILDING	AC-2	4	3			32.80				145		2		1	534	1,274	2.4	3.7
4530	SMA BUILDING	AC-2	4	4						3	60						512	N/A	N/A
4530	SMA BUILDING	AC-2	4	1	2.60	5,906.20	459.50				2,367	1		2	1	584	20,742	35.5	0.2
4530	SMA BUILDING	AC-3	4	1	0.90	2,095.90	85.30				497	1		2	1	584	4,338	7.4	1.2
4530	SMA BUILDING	AC-3	4	4						3	60						512	N/A	N/A
4530	SMA BUILDING	AC-3	4	3			6.10				27		2		1	534	237	0.4	19.9
4530	SMA BUILDING	ACC-1	11	4						3	60						512	N/A	N/A
4530	SMA BUILDING	ACC-2	11	4						3	60						512	N/A	N/A
4530	SMA BUILDING	ACC-3	11	4						3	60						512	N/A	N/A
4530	SMA BUILDING	HTP-1	9	4						3	60						512	N/A	N/A
4530	SMA BUILDING	HTP-1	9	1		63,811.00	947.40				7,668	1		1		289	66,373	229.7	0.0
4530	SMA BUILDING	HTP-1	9	3			67.60				298						2,626	N/A	N/A
4530	SMA BUILDING	HTP-1	9	7			165.80				731		1		2	773	6,442	8.3	1.1
4530	SMA BUILDING	HV-1	2	4						3	60						512	N/A	N/A
4530	SMA BUILDING	HV-1	2	1		135,333.80	259.00				8,545	1	1	2	1	756	72,764	96.2	0.1
4530	SMA BUILDING	HV-1	2	3			18.50				82		1		1	363	719	2.0	4.4
4530	SMA BUILDING	HV-2	2	4						3	60						512	N/A	N/A
4530	SMA BUILDING	HV-2	2	3			90.50				399		1		1	363	3,516	9.7	0.9
4530	SMA BUILDING	HV-2	2	1		135,333.80	1,268.00				12,995	1	1	2	1	756	111,966	148.1	0.1
4530	SMA BUILDING	HV-3	2	3			32.80				145		1		1	363	1,274	3.5	2.5
4530	SMA BUILDING	HV-3	2	4						3	60						512	N/A	N/A
4530	SMA BUILDING	HV-3	2	1		135,333.80	459.50				9,429	1	1	2	1	756	80,554	106.6	0.1
4530	SMA BUILDING	MAU-1	1	3			177.80				784		1		1	363	6,908	19.0	0.5
4530	SMA BUILDING	MAU-1	1	1		120,296.70	2,491.80				17,569	1	1	1	1	604	152,546	252.6	0.0
4530	SMA BUILDING	MAU-1	1	4						3	60						512	N/A	N/A
4530	SMA BUILDING	MAU-2	1	4						3	60						512	N/A	N/A
4530	SMA BUILDING	MAU-2	1	3			177.80				784		1		1	363	6,908	19.0	0.5
4530	SMA BUILDING	MAU-2	1	1		120,296.70	2,491.80				17,569	1	1	1	1	604	152,546	252.6	0.0
4530	SMA BUILDING	MAU-3	1	1		90,622.60	1,749.60				12,673	1	1	1	1	604	109,962	182.1	0.0
4530	SMA BUILDING	MAU-3	1	3			124.90				551		1		1	363	4,853	13.4	0.7
4530	SMA BUILDING	MAU-3	1	4						3	60						512	N/A	N/A
4530	SMA BUILDING	MAU-4	1	4						3	60						512	N/A	N/A
4530	SMA BUILDING	MAU-5	1	4						3	60						512	N/A	N/A
4530	SMA BUILDING	MAU-6	1	4						3	60						512	N/A	N/A
4530	SMA BUILDING	MAU-7	1	1		2,095.90	9.50				157	1	1	1	1	604	1,340	2.2	3.9
4530	SMA BUILDING	MAU-7	1	3			0.70				3		1		1	363	27	0.1	117.6
4530	SMA BUILDING	MAU-7	1	4						3	60						512	N/A	N/A
4530	SMA BUILDING	MAU-8	1	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
4530	SMA BUILDING	MAU-9	1	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-1	3	3			5.80				26		2		1	534	225	0.4	20.9
10000	DIV CMD/CNTRL BLDG	AHU-1	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-1	3	1		4,582.20	40.40				429	1	1	1	1	604	3,693	6.1	1.4
10000	DIV CMD/CNTRL BLDG	AHU-10	3	1	0.60	1,615.90	36.40				253	1	1	1	1	604	2,198	3.6	2.4
10000	DIV CMD/CNTRL BLDG	AHU-10	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-10	3	3			5.30				23		2		1	534	206	0.4	22.8
10000	DIV CMD/CNTRL BLDG	AHU-11	3	3			3.20				14		2		1	534	124	0.2	37.8
10000	DIV CMD/CNTRL BLDG	AHU-11	3	1	0.50	1,222.10	22.30				169	1	1	1	1	604	1,462	2.4	3.6
10000	DIV CMD/CNTRL BLDG	AHU-11	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-12	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-12	3	1	0.50	1,230.70	164.00				794	1	1	1	1	604	6,971	11.5	0.8
10000	DIV CMD/CNTRL BLDG	AHU-12	3	3			23.80				105		2		1	534	925	1.7	5.1
10000	DIV CMD/CNTRL BLDG	AHU-13	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-13	3	3			23.80				105		2		1	534	925	1.7	5.1
10000	DIV CMD/CNTRL BLDG	AHU-13	3	1	0.50	1,230.70	164.00				794	1	1	1	1	604	6,971	11.5	0.8
10000	DIV CMD/CNTRL BLDG	AHU-14	1	1		12,000.60	778.70				4,090	1	1	1	1	604	35,814	59.3	0.1
10000	DIV CMD/CNTRL BLDG	AHU-14	1	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-14	1	3			113.30				500		1		1	363	4,402	12.1	0.7
10000	DIV CMD/CNTRL BLDG	AHU-15	1	1		4,566.70	493.50				2,426	1	1	1	1	604	21,289	35.2	0.2
10000	DIV CMD/CNTRL BLDG	AHU-15	1	3			72.00				318		1		1	363	2,797	7.7	1.1
10000	DIV CMD/CNTRL BLDG	AHU-15	1	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-16	1	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-16	1	1		2,430.90	311.40				1,506	1	1	1	1	604	13,225	21.9	0.4
10000	DIV CMD/CNTRL BLDG	AHU-16	1	3			45.40				200		1		1	363	1,764	4.9	1.8
10000	DIV CMD/CNTRL BLDG	AHU-2	3	1	3.10	8,120.80	58.30				723	1	1	1	1	604	6,209	10.3	0.8
10000	DIV CMD/CNTRL BLDG	AHU-2	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-2	3	3			8.40				37		2		1	534	326	0.6	14.4
10000	DIV CMD/CNTRL BLDG	AHU-3	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-3	3	1	3.10	8,141.70	87.90				854	1	1	1	1	604	7,369	12.2	0.7
10000	DIV CMD/CNTRL BLDG	AHU-3	3	3			12.60				56		2		1	534	490	0.9	9.6
10000	DIV CMD/CNTRL BLDG	AHU-4	3	3			13.30				59		2		1	534	517	1.0	9.1
10000	DIV CMD/CNTRL BLDG	AHU-4	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-4	3	1	2.60	6,884.40	92.40				802	1	1	1	1	604	6,932	11.5	0.8
10000	DIV CMD/CNTRL BLDG	AHU-5	3	1	0.60	1,662.50	17.20				171	1	1	1	1	604	1,474	2.4	3.5
10000	DIV CMD/CNTRL BLDG	AHU-5	3	3			2.40				11		2		1	534	93	0.2	50.5
10000	DIV CMD/CNTRL BLDG	AHU-5	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-6	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-6	3	3			0.70				3		2		1	534	27	0.1	173.0
10000	DIV CMD/CNTRL BLDG	AHU-6	3	1	0.20	613.20	4.80				56	1	1	1	1	604	482	0.8	10.8
10000	DIV CMD/CNTRL BLDG	AHU-7	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-7	3	3			7.40				33		2		1	534	288	0.5	16.4
10000	DIV CMD/CNTRL BLDG	AHU-7	3	1	1.40	3,651.80	51.00				434	1	1	1	1	604	3,756	6.2	1.4
10000	DIV CMD/CNTRL BLDG	AHU-8	3	3			6.00				26		2		1	534	233	0.4	20.2
10000	DIV CMD/CNTRL BLDG	AHU-8	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-8	3	1	0.6	1,615.90	41.60				276	1	1	1	1	604	2,400	4.0	2.2
10000	DIV CMD/CNTRL BLDG	AHU-9	3	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	AHU-9	3	3			3.90				17		2		1	534	152	0.3	31.0
10000	DIV CMD/CNTRL BLDG	AHU-9	3	1	0.6	1,615.90	27.20				212	1	1	1	1	604	1,841	3.0	2.8
10000	DIV CMD/CNTRL BLDG	CH-1	8	6		287.00					16						133	N/A	N/A
10000	DIV CMD/CNTRL BLDG	CH-1	8	4						3	60				2	602	512	0.9	10.0

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10000	DIV CMD/CNTRL BLDG	CH-1	8	1	1.4						10	2		2		578	82	0.1	60.0
10000	DIV CMD/CNTRL BLDG	CH-2	8	6		287.00					16						133	N/A	N/A
10000	DIV CMD/CNTRL BLDG	CH-2	8	1	1.4						10	2		2		578	82	0.1	60.0
10000	DIV CMD/CNTRL BLDG	CH-2	8	4						3	60				2	602	512	0.9	10.0
10000	DIV CMD/CNTRL BLDG	FTR	12	3			223.70				987		1		1	472	8,691	18.4	0.5
10000	DIV CMD/CNTRL BLDG	FTR	12	1		5,365.40	1,533.10				7,054	1		1	2	576	62,050	107.7	0.1
10000	DIV CMD/CNTRL BLDG	FTR	12	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	HE-1	9	7			10.20				45		1		2	773	396	0.5	17.2
10000	DIV CMD/CNTRL BLDG	HE-1	9	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	HE-2	9	7			8.20				36		1		2	773	319	0.4	21.4
10000	DIV CMD/CNTRL BLDG	HE-2	9	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	SF-1	14	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	SF-1	14	1		2,777.30					152	1		1	1	433	1,287	3.0	2.9
10000	DIV CMD/CNTRL BLDG	SF-2	14	1		2,777.30					152	1		1	1	433	1,287	3.0	2.9
10000	DIV CMD/CNTRL BLDG	SF-2	14	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	SF-3	14	1		2,777.30					152	1		1	1	433	1,287	3.0	2.9
10000	DIV CMD/CNTRL BLDG	SF-3	14	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	SF-31	14	1		3,285.20					180	1		1	1	433	1,522	3.5	2.4
10000	DIV CMD/CNTRL BLDG	SF-31	14	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	SF-4	14	4						3	60						512	N/A	N/A
10000	DIV CMD/CNTRL BLDG	SF-4	14	1		3,285.20					180	1		1	1	433	1,522	3.5	2.4
10030	UNIT CHAPEL	AHU-1	2	1		97,058.70	390.10				7,029	1	1	2	1	756	60,124	79.5	0.1
10030	UNIT CHAPEL	AHU-1	2	3			9.60				42		1		1	363	373	1.0	8.6
10030	UNIT CHAPEL	AHU-1	2	4						3	60						512	N/A	N/A
10030	UNIT CHAPEL	AHU-2	2	4						3	60						512	N/A	N/A
10030	UNIT CHAPEL	AHU-2	2	3			68.40				302		1		1	363	2,657	7.3	1.2
10030	UNIT CHAPEL	AHU-2	2	1		52,521.50	196.90				3,741	1	1	2	1	756	31,984	42.3	0.2
10030	UNIT CHAPEL	FTR-1	12	3			25.30				112		1		1	472	983	2.1	4.2
10030	UNIT CHAPEL	FTR-1	12	1		4,888.10	66.20				559	1		1	2	576	4,837	8.4	1.0
10030	UNIT CHAPEL	FTR-1	12	4						3	60						512	N/A	N/A
10030	UNIT CHAPEL	HE-1	9	7			3.70				16		1		2	773	144	0.2	47.4
10030	UNIT CHAPEL	HE-1	9	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH1	1	1		31,535.60	584.00				4,300	1	1	1	1	604	37,300	61.8	0.1
10050	PHYS FIT CENTER	AH1	1	3			105.40				465		1		1	363	4,095	11.3	0.8
10050	PHYS FIT CENTER	AH1	1	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH10	7	1		21,244.30	333.70				2,634	2		2	2	843	22,808	27.1	0.3
10050	PHYS FIT CENTER	AH10	7	3			60.20				265		3		2	1,007	2,339	2.3	3.8
10050	PHYS FIT CENTER	AH10	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH11	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH11	7	1		21,244.30	375.40				2,818	2		2	2	843	24,428	29.0	0.3
10050	PHYS FIT CENTER	AH11	7	3			67.70				299		3		2	1,007	2,630	2.6	3.4
10050	PHYS FIT CENTER	AH12	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH12	7	3			52.70				232		3		2	1,007	2,048	2.0	4.3
10050	PHYS FIT CENTER	AH12	7	1		16,450.90	292.00				2,188	2		2	2	843	18,967	22.5	0.4
10050	PHYS FIT CENTER	AH2	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH2	7	1		31,535.00	584.00				4,300	2		2	2	843	37,300	44.2	0.2
10050	PHYS FIT CENTER	AH2	7	3			105.40				465		3		2	1,007	4,095	4.1	2.2
10050	PHYS FIT CENTER	AH3	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH3	7	3			105.40				465		3		2	1,007	4,095	4.1	2.2
10050	PHYS FIT CENTER	AH3	7	1		31,535.60	584.00				4,300	2		2	2	843	37,300	44.2	0.2
10050	PHYS FIT CENTER	AH4	7	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10050	PHYS FIT CENTER	AH4	7	3			105.40				465		3		2	1,007	4,095	4.1	2.2
10050	PHYS FIT CENTER	AH4	7	1		31,535.60	584.00				4,300	2		2	2	843	37,300	44.2	0.2
10050	PHYS FIT CENTER	AH5	7	1		23,175.20	166.80				2,003	2		2	2	843	17,218	20.4	0.4
10050	PHYS FIT CENTER	AH5	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH5	7	3			30.10				133		3		2	1,007	1,169	1.2	7.6
10050	PHYS FIT CENTER	AH6	7	3			30.10				133		3		2	1,007	1,169	1.2	7.6
10050	PHYS FIT CENTER	AH6	7	1		23,175.20	166.80				2,003	2		2	2	843	17,218	20.4	0.4
10050	PHYS FIT CENTER	AH6	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH7	7	1		10,495.40	66.70				868	2		2	2	843	7,454	8.8	1.0
10050	PHYS FIT CENTER	AH7	7	3			12.00				53		3		2	1,007	466	0.5	19.0
10050	PHYS FIT CENTER	AH7	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH8	7	1		16,450.90	250.30				2,004	2		2	2	843	17,347	20.6	0.4
10050	PHYS FIT CENTER	AH8	7	3			45.20				199		3		2	1,007	1,756	1.7	5.1
10050	PHYS FIT CENTER	AH8	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH9	7	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	AH9	7	1		6,921.90	116.80				894	2		2	2	843	7,745	9.2	0.9
10050	PHYS FIT CENTER	AH9	7	3			21.10				93		3		2	1,007	820	0.8	10.8
10050	PHYS FIT CENTER	HE1	9	7			4.20				19		1		2	773	163	0.2	41.7
10050	PHYS FIT CENTER	HE1	9	1		7,119.70	66.70				684	1		1		289	5,890	20.4	0.4
10050	PHYS FIT CENTER	HE1	9	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	HE2	9	7			48.20				213		1		2	773	1,873	2.4	3.6
10050	PHYS FIT CENTER	HE2	9	1		20,102.80	4,104.40				19,200	1		1		289	168,778	584.0	0.0
10050	PHYS FIT CENTER	HE2	9	4						3	60						512	N/A	N/A
10050	PHYS FIT CENTER	HE3	9	7			7.90				35		1		2	773	307	0.4	22.2
10050	PHYS FIT CENTER	HE3	9	1		25,844.70					1,414	1		1		289	11,974	41.4	0.2
10050	PHYS FIT CENTER	HE3	9	4						3	60						512	N/A	N/A
10100	BRIGADE HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10100	BRIGADE HQ BLDG	AHU1	1	1		8,501.70	147.60				1,116	1	1	1	1	604	9,673	16.0	0.5
10100	BRIGADE HQ BLDG	AHU1	1	3			11.40				50		1		1	363	443	1.2	7.2
10100	BRIGADE HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10100	BRIGADE HQ BLDG	AHU2	1	3			2.20				10		1		1	363	85	0.2	37.4
10100	BRIGADE HQ BLDG	AHU2	1	1		4,791.40	28.10				386	1	1	1	1	604	3,312	5.5	1.6
10100	BRIGADE HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10100	BRIGADE HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10100	BRIGADE HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10100	BRIGADE HQ BLDG	HE2-PER	12	3			40.90				180		1		1	472	1,589	3.4	2.6
10100	BRIGADE HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10100	BRIGADE HQ BLDG	HE2-PER	12	1		2,397.80	527.00				2,455	1		1	2	576	21,586	37.5	0.2
10110	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10110	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10110	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10110	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10110	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10110	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10110	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10110	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10110	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10110	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10110	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10110	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10110	BN HQ BLDG	HE1	9	1		8,502.00					465	1		1		289	3,939	13.6	0.6

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10110	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10110	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10110	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10110	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10110	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10110	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10110	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10110	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10110	BN HQ BLDG	HE2-PER	12	1		2,397.60	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10110	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10110	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			12.20				54		1		1	363	474	1.3	6.7
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			12.20				54		1		1	363	474	1.3	6.7
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			12.20				54		1		1	363	474	1.3	6.7
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			87.80				387		1		1	363	3,411	9.4	0.9
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			87.80				387		1		1	363	3,411	9.4	0.9
10112	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10112	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10112	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10112	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10112	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10112	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			11.70				52		1		1	363	455	1.3	7.0
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	97.30				521	1	1	1	1	604	4,560	7.5	1.2
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	97.30				521	1	1	1	1	604	4,560	7.5	1.2
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			11.70				52		1		1	363	455	1.3	7.0
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	97.30				521	1	1	1	1	604	4,560	7.5	1.2
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			11.70				52		1		1	363	455	1.3	7.0
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			84.10				371		1		1	363	3,267	9.0	1.0
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10114	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			84.10				371		1		1	363	3,267	9.0	1.0
10114	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10114	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10114	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10114	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10114	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10120	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10120	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10120	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10120	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10120	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10120	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10120	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10120	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10120	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10120	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10120	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10120	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			12.20				54		1		1	363	474	1.3	6.7
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			12.20				54		1		1	363	474	1.3	6.7
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			12.20				54		1		1	363	474	1.3	6.7
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			87.80				387		1		1	363	3,411	9.4	0.9
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10122	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			87.80				387		1		1	363	3,411	9.4	0.9
10122	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10122	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10122	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10122	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10122	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	97.30				521	1	1	1	1	604	4,560	7.5	1.2
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			11.70				52		1		1	363	455	1.3	7.0
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			11.70				52		1		1	363	455	1.3	7.0
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	97.30				521	1	1	1	1	604	4,560	7.5	1.2
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			11.70				52		1		1	363	455	1.3	7.0
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	97.30				521	1	1	1	1	604	4,560	7.5	1.2
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			84.10				371		1		1	363	3,267	9.0	1.0
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10124	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			84.10				371		1		1	363	3,267	9.0	1.0
10124	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10124	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10124	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10124	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10124	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10130	BN HQ BLDG	AHU1	1	3			13.50				60		1		1	363	525	1.4	6.1
10130	BN HQ BLDG	AHU1	1	1		8,501.70	174.50				1,235	1	1	1	1	604	10,719	17.7	0.5
10130	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10130	BN HQ BLDG	AHU2	1	1		4,791.40	33.20				409	1	1	1	1	604	3,510	5.8	1.5
10130	BN HQ BLDG	AHU2	1	3			2.60				11		1		1	363	101	0.3	31.7
10130	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10130	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10130	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10130	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10130	BN HQ BLDG	HE2-PER	12	1		2,397.80	623.30				2,880	1		1	2	576	25,327	44.0	0.2
10130	BN HQ BLDG	HE2-PER	12	3			48.30				213		1		1	472	1,877	4.0	2.2
10130	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			77.50				342		1		1	363	3,011	8.3	1.1
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			77.50				342		1		1	363	3,011	8.3	1.1
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			9.10				40		1		1	363	354	1.0	9.0
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	75.90				427	1	1	1	1	604	3,729	6.2	1.4
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			9.10				40		1		1	363	354	1.0	9.0
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	75.90				427	1	1	1	1	604	3,729	6.2	1.4
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			9.10				40		1		1	363	354	1.0	9.0
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	75.90				427	1	1	1	1	604	3,729	6.2	1.4
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			9.10				40		1		1	363	354	1.0	9.0
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	75.90				427	1	1	1	1	604	3,729	6.2	1.4
10132	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10132	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10132	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			92.20				407		1		1	363	3,582	9.9	0.9
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			92.20				407		1		1	363	3,582	9.9	0.9
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			15.10				67		1		1	363	587	1.6	5.5
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	125.90				647	1	1	1	1	604	5,671	9.4	0.9
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	125.90				647	1	1	1	1	604	5,671	9.4	0.9

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			15.10				67		1		1	363	587	1.6	5.5
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			15.10				67		1		1	363	587	1.6	5.5
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	125.90				647	1	1	1	1	604	5,671	9.4	0.9
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			15.10				67		1		1	363	587	1.6	5.5
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	125.90				647	1	1	1	1	604	5,671	9.4	0.9
10134	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10134	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10134	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10150	ENL PERS DIN	AHU1	1	3			63.00				278		1		1	363	2,448	6.7	1.3
10150	ENL PERS DIN	AHU1	1	4						3	60						512	N/A	N/A
10150	ENL PERS DIN	AHU1	1	1		12,801.70	174.40				1,469	1	1	1	1	604	12,707	21.0	0.4
10150	ENL PERS DIN	AHU2	2	1		15,122.30	294.70				2,127	1	1	2	1	756	18,456	24.4	0.4
10150	ENL PERS DIN	AHU2	2	4						3	60						512	N/A	N/A
10150	ENL PERS DIN	AHU2	2	3			106.50				470		1		1	363	4,138	11.4	0.8
10150	ENL PERS DIN	AHU3	2	3			93.90				414		1		1	363	3,648	10.1	0.9
10150	ENL PERS DIN	AHU3	2	1		18,308.00	260.00				2,148	1	1	2	1	756	18,584	24.6	0.4
10150	ENL PERS DIN	AHU3	2	4						3	60						512	N/A	N/A
10150	ENL PERS DIN	AHU4	2	1		27,177.00	416.10				3,322	1	1	2	1	756	28,758	38.0	0.2
10150	ENL PERS DIN	AHU4	2	3			150.30				663		1		1	363	5,839	16.1	0.5
10150	ENL PERS DIN	AHU4	2	4						3	60						512	N/A	N/A
10150	ENL PERS DIN	AHU5	2	3			62.60				276		1		1	363	2,432	6.7	1.3
10150	ENL PERS DIN	AHU5	2	4						3	60						512	N/A	N/A
10150	ENL PERS DIN	AHU5	2	1		11,550.20	173.40				1,396	1	1	2	1	756	12,088	16.0	0.5
10150	ENL PERS DIN	AHU6	1	4						3	60						512	N/A	N/A
10150	ENL PERS DIN	AHU6	1	1		7,181.90	29.20				522	1	1	1	1	604	4,462	7.4	1.2
10150	ENL PERS DIN	AHU6	1	3			10.60				47		1		1	363	412	1.1	7.8
10150	ENL PERS DIN	HE1	9	3			46.30				204						1,799	N/A	N/A
10150	ENL PERS DIN	HE1	9	1		3,637.00	128.30				765	1		1		289	6,670	23.1	0.4
10150	ENL PERS DIN	HE1	9	4						3	60						512	N/A	N/A
10150	ENL PERS DIN	HE1	9	7			11.10				49		1		2	773	431	0.6	15.8
10170	VEH MAINT SHOP	HTP1	12	1		12,616.70	57.70				945	1		1	2	576	8,087	14.0	0.6
10170	VEH MAINT SHOP	HTP1	12	3			14.70				65		1		1	472	571	1.2	7.3
10170	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
10170	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
10170	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10170	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10170	VEH MAINT SHOP	HV1	2	1		83,884.90	24.10				4,695	1	1	2	1	756	39,801	52.6	0.2
10170	VEH MAINT SHOP	HV1	2	3			6.10				27		1		1	363	237	0.7	13.5
10170	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	HV2	2	3			6.10				27		1		1	363	237	0.7	13.5
10170	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	HV2	2	1		101,035.00	24.10				5,633	1	1	2	1	756	47,747	63.2	0.1
10170	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	HV3	2	1		83,884.90	24.10				4,695	1	1	2	1	756	39,801	52.6	0.2

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10170	VEH MAINT SHOP	HV3	2	3			6.10				27		1		1	363	237	0.7	13.5
10170	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	HV4	2	3			3.10				14		1		1	363	120	0.3	26.6
10170	VEH MAINT SHOP	HV4	2	1		83,885.00	12.00				4,641	1	1	2	1	756	39,331	52.0	0.2
10170	VEH MAINT SHOP	MAU1	1	1		56,826.30	14.40				3,172	1	1	1	1	604	26,888	44.5	0.2
10170	VEH MAINT SHOP	MAU1	1	3			3.70				16		1		1	363	144	0.4	22.2
10170	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	MAU2	1	1		56,826.30	7.20				3,140	1	1	1	1	604	26,608	44.1	0.2
10170	VEH MAINT SHOP	MAU2	1	3			1.80				8		1		1	363	70	0.2	45.7
10170	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	MAU3	1	1		56,826.30	14.40				3,172	1	1	1	1	604	26,888	44.5	0.2
10170	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	MAU3	1	3			3.70				16		1		1	363	144	0.4	22.2
10170	VEH MAINT SHOP	MAU4	1	1		56,826.30	14.40				3,172	1	1	1	1	604	26,888	44.5	0.2
10170	VEH MAINT SHOP	MAU4	1	3			3.70				16		1		1	363	144	0.4	22.2
10170	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	MAU5	1	1		56,826.30	7.20				3,140	1	1	1	1	604	26,608	44.1	0.2
10170	VEH MAINT SHOP	MAU5	1	3			1.80				8		1		1	363	70	0.2	45.7
10170	VEH MAINT SHOP	MAU6	1	1		56,826.30	12.00				3,161	1	1	1	1	604	26,794	44.4	0.2
10170	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10170	VEH MAINT SHOP	MAU6	1	3			3.10				14		1		1	363	120	0.3	26.6
10170	VEH MAINT SHOP	MAU7	1	1		29,644.00	4.80				1,643	1	1	1	1	604	13,921	23.0	0.4
10170	VEH MAINT SHOP	MAU7	1	3			1.20				5		1		1	363	47	0.1	68.6
10170	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10200	BRIGADE HQ BLDG	AHU1	1	3			11.40				50		1		1	363	443	1.2	7.2
10200	BRIGADE HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10200	BRIGADE HQ BLDG	AHU1	1	1		8,501.70	147.50				1,116	1	1	1	1	604	9,670	16.0	0.5
10200	BRIGADE HQ BLDG	AHU2	1	1		4,791.40	28.10				386	1	1	1	1	604	3,312	5.5	1.6
10200	BRIGADE HQ BLDG	AHU2	1	3			2.20				10		1		1	363	85	0.2	37.4
10200	BRIGADE HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10200	BRIGADE HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10200	BRIGADE HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10200	BRIGADE HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10200	BRIGADE HQ BLDG	HE2-PER	12	3			40.90				180		1		1	472	1,589	3.4	2.6
10200	BRIGADE HQ BLDG	HE2-PER	12	1		2,397.80	527.00				2,455	1		1	2	576	21,586	37.5	0.2
10200	BRIGADE HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10205	DENTAL CLINIC	ACC1	11	1	4.5	4,865.50					297	1		1		289	2,518	8.7	1.0
10205	DENTAL CLINIC	ACC1	11	4						3	60						512	N/A	N/A
10205	DENTAL CLINIC	AHU1	7	3		16,102.00	10.50				927		3		2	1,007	7,868	7.8	1.1
10205	DENTAL CLINIC	AHU1	7	1	28.1	122,406.00	130.40				7,464	2		2	2	843	63,427	75.2	0.1
10205	DENTAL CLINIC	AHU1	7	4						6	120						1,024	N/A	N/A
10205	DENTAL CLINIC	HX1	12	1		2,865.00	872.00				4,002	1		1	2	576	35,206	61.1	0.1
10205	DENTAL CLINIC	HX1	12	4						3	60						512	N/A	N/A
10205	DENTAL CLINIC	HX1	12	3			70.20				310		1		1	472	2,727	5.8	1.5
10205	DENTAL CLINIC	HX2	9	7			2.30				10		1		2	773	89	0.1	76.2
10205	DENTAL CLINIC	HX2	9	4						3	60						512	N/A	N/A
10205	DENTAL CLINIC	HX2	9	1		1,016.80					56	1		1		289	471	1.6	5.2
10207	EXCHANGE/CLUB	AHU1	4	1	4.7	13,071.40	108.90				1,228	1		2	1	584	10,563	18.1	0.5
10207	EXCHANGE/CLUB	AHU1	4	3			32.30				142		2		1	534	1,255	2.4	3.7
10207	EXCHANGE/CLUB	AHU1	4	2		982.70					54		1		2	647	455	0.7	12.0

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10207	EXCHANGE/CLUB	AHU1	4	4						3	60						512	N/A	N/A
10207	EXCHANGE/CLUB	AHU2	3	1	10.8	3,223.10	196.70				1,118	1	1	1	1	604	9,769	16.2	0.5
10207	EXCHANGE/CLUB	AHU2	3	2		1,768.90					97						820	N/A	N/A
10207	EXCHANGE/CLUB	AHU2	3	3			56.10				247		2		1	534	2,180	4.1	2.2
10207	EXCHANGE/CLUB	AHU2	3	4						3	60						512	N/A	N/A
10207	EXCHANGE/CLUB	AHU3	3	4						3	60						512	N/A	N/A
10207	EXCHANGE/CLUB	AHU3	3	3			77.60				342		2		1	534	3,015	5.6	1.6
10207	EXCHANGE/CLUB	AHU3	3	2		2,397.80					131						1,111	N/A	N/A
10207	EXCHANGE/CLUB	AHU3	3	1	10.8	31,166.00	210.00				2,705	1	1	1	1	604	23,232	38.5	0.2
10207	EXCHANGE/CLUB	AHU4	3	3			49.60				219		2		1	534	1,927	3.6	2.4
10207	EXCHANGE/CLUB	AHU4	3	2		1,572.30					86						728	N/A	N/A
10207	EXCHANGE/CLUB	AHU4	3	1	10.8	24,553.90	168.40				2,160	1	1	1	1	604	18,553	30.7	0.3
10207	EXCHANGE/CLUB	AHU4	3	4						3	60						512	N/A	N/A
10207	EXCHANGE/CLUB	B1	8	4						3	60				2	602	512	0.9	10.0
10207	EXCHANGE/CLUB	B1	8	1		4,741.30					259	2		2		578	2,197	3.8	2.2
10207	EXCHANGE/CLUB	B1	8	7				7.60			32						310	N/A	N/A
10207	EXCHANGE/CLUB	B2	8	7				7.60			32						310	N/A	N/A
10207	EXCHANGE/CLUB	B2	8	1		4,741.30					259	2		2		578	2,197	3.8	2.2
10207	EXCHANGE/CLUB	B2	8	4						3	60				2	602	512	0.9	10.0
10207	EXCHANGE/CLUB	B3	8	7				7.60			32						310	N/A	N/A
10207	EXCHANGE/CLUB	B3	8	4						3	60				2	602	512	0.9	10.0
10207	EXCHANGE/CLUB	B3	8	1		4,741.30					259	2		2		578	2,197	3.8	2.2
10207	EXCHANGE/CLUB	WC1	8	4						3	60				2	602	512	0.9	10.0
10207	EXCHANGE/CLUB	WC1	8	6		698.60					38						324	N/A	N/A
10207	EXCHANGE/CLUB	WC1	8	1	10.8	10,809.90					666	2		2		578	5,642	9.8	0.9
10210	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10210	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10210	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10210	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10210	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10210	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10210	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10210	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10210	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10210	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10210	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.20				2,703	1		1	2	576	23,769	41.3	0.2
10210	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			79.90				352		1		1	363	3,104	8.6	1.0
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			79.90				352		1		1	363	3,104	8.6	1.0
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.10				58		1		1	363	509	1.4	6.3

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.10				58		1		1	363	509	1.4	6.3
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.10				58		1		1	363	509	1.4	6.3
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	109.20				574	1	1	1	1	604	5,022	8.3	1.1
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.10				58		1		1	363	509	1.4	6.3
10212	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10212	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10212	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			12.20				54		1		1	363	474	1.3	6.7
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	101.20				538	1	1	1	1	604	4,712	7.8	1.1
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			12.20				54		1		1	363	474	1.3	6.7
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	101.20				538	1	1	1	1	604	4,712	7.8	1.1
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	101.20				538	1	1	1	1	604	4,712	7.8	1.1
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			12.20				54		1		1	363	474	1.3	6.7
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			87.50				386		1		1	363	3,400	9.4	0.9
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			87.50				386		1		1	363	3,400	9.4	0.9
10214	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10214	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10214	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10214	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10214	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10214	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10220	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10220	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10220	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10220	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10220	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10220	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10220	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10220	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10220	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10220	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10220	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10220	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.20				2,703	1		1	2	576	23,769	41.3	0.2
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			79.90				352		1		1	363	3,104	8.6	1.0
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			79.90				352		1		1	363	3,104	8.6	1.0
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.10				58		1		1	363	509	1.4	6.3
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.10				58		1		1	363	509	1.4	6.3
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.10				58		1		1	363	509	1.4	6.3
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.10				58		1		1	363	509	1.4	6.3
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	109.20				574	1	1	1	1	604	5,022	8.3	1.1
10222	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10222	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10222	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10222	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	101.20				538	1	1	1	1	604	4,712	7.8	1.1
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			12.20				54		1		1	363	474	1.3	6.7
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	101.20				538	1	1	1	1	604	4,712	7.8	1.1
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			12.20				54		1		1	363	474	1.3	6.7
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	101.20				538	1	1	1	1	604	4,712	7.8	1.1
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			12.20				54		1		1	363	474	1.3	6.7
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			87.50				386		1		1	363	3,400	9.4	0.9
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10224	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			87.50				386		1		1	363	3,400	9.4	0.9
10224	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10224	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10224	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10224	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10224	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10230	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10230	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10230	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10230	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10230	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10230	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10230	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10230	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10230	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10230	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10230	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.20				2,703	1		1	2	576	23,769	41.3	0.2
10230	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			80.00				353		1		1	363	3,108	8.6	1.0
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			80.00				353		1		1	363	3,108	8.6	1.0
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.10				58		1		1	363	509	1.4	6.3
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.10				58		1		1	363	509	1.4	6.3
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.10				58		1		1	363	509	1.4	6.3
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.10				58		1		1	363	509	1.4	6.3
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	109.20				574	1	1	1	1	604	5,022	8.3	1.1
10232	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10232	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10232	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10232	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			88.90				392		1		1	363	3,454	9.5	0.9
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			88.90				392		1		1	363	3,454	9.5	0.9
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			14.60				64		1		1	363	567	1.6	5.6
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	121.40				627	1	1	1	1	604	5,497	9.1	1.0
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			14.60				64		1		1	363	567	1.6	5.6
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	121.40				627	1	1	1	1	604	5,497	9.1	1.0
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	121.40				627	1	1	1	1	604	5,497	9.1	1.0
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			14.60				64		1		1	363	567	1.6	5.6
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	121.40				627	1	1	1	1	604	5,496	9.1	1.0
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			14.60				64		1		1	363	567	1.6	5.6
10234	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10234	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10234	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10250	ENL PERS DIN	AHU1	1	3			63.00				278		1		1	363	2,448	6.7	1.3
10250	ENL PERS DIN	AHU1	1	4						3	60						512	N/A	N/A
10250	ENL PERS DIN	AHU1	1	1		12,801.70	174.40				1,469	1	1	1	1	604	12,707	21.0	0.4
10250	ENL PERS DIN	AHU2	2	4						3	60						512	N/A	N/A
10250	ENL PERS DIN	AHU2	2	3			107.00				472		1		1	363	4,157	11.5	0.8
10250	ENL PERS DIN	AHU2	2	1		15,122.30	296.20				2,133	1	1	2	1	756	18,514	24.5	0.4
10250	ENL PERS DIN	AHU3	2	1		18,308.00	261.30				2,154	1	1	2	1	756	18,634	24.6	0.4
10250	ENL PERS DIN	AHU3	2	3			94.40				416		1		1	363	3,668	10.1	0.9
10250	ENL PERS DIN	AHU3	2	4						3	60						512	N/A	N/A
10250	ENL PERS DIN	AHU4	2	3			151.10				666		1		1	363	5,871	16.2	0.5
10250	ENL PERS DIN	AHU4	2	1		27,177.00	418.10				3,330	1	1	2	1	756	28,835	38.1	0.2
10250	ENL PERS DIN	AHU4	2	4						3	60						512	N/A	N/A
10250	ENL PERS DIN	AHU5	2	3			62.90				277		1		1	363	2,444	6.7	1.3
10250	ENL PERS DIN	AHU5	2	4						3	60						512	N/A	N/A
10250	ENL PERS DIN	AHU5	2	1		11,550.20	174.20				1,400	1	1	2	1	756	12,119	16.0	0.5
10250	ENL PERS DIN	AHU6	1	3			10.10				45		1		1	363	392	1.1	8.1
10250	ENL PERS DIN	AHU6	1	1		7,181.90	27.90				516	1	1	1	1	604	4,411	7.3	1.2
10250	ENL PERS DIN	AHU6	1	4						3	60						512	N/A	N/A
10250	ENL PERS DIN	HE1	9	1		3,637.00	128.90				767	1		1		289	6,693	23.2	0.4
10250	ENL PERS DIN	HE1	9	4						3	60						512	N/A	N/A
10250	ENL PERS DIN	HE1	9	3			46.60				206						1,811	N/A	N/A
10250	ENL PERS DIN	HE1	9	7			11.10				49		1		2	773	431	0.6	15.8
10270	VEH MAINT SHOP	HTP1	12	1		12,616.70	57.70				945	1		1	2	576	8,087	14.0	0.6
10270	VEH MAINT SHOP	HTP1	12	3			14.70				65		1		1	472	571	1.2	7.3
10270	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
10270	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
10270	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10270	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10270	VEH MAINT SHOP	HV1	2	3			6.10				27		1		1	363	237	0.7	13.5
10270	VEH MAINT SHOP	HV1	2	1		83,884.90	24.10				4,695	1	1	2	1	756	39,801	52.6	0.2
10270	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	HV2	2	1		101,035.00	24.10				5,633	1	1	2	1	756	47,747	63.2	0.1
10270	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	HV2	2	3			6.10				27		1		1	363	237	0.7	13.5
10270	VEH MAINT SHOP	HV3	2	1		83,884.90	24.10				4,695	1	1	2	1	756	39,801	52.6	0.2
10270	VEH MAINT SHOP	HV3	2	3			6.10				27		1		1	363	237	0.7	13.5
10270	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	HV4	2	3			3.10				14		1		1	363	120	0.3	26.6
10270	VEH MAINT SHOP	HV4	2	1		83,884.90	12.00				4,641	1	1	2	1	756	39,331	52.0	0.2

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10270	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	MAU1	1	3			3.70				16		1		1	363	144	0.4	22.2
10270	VEH MAINT SHOP	MAU1	1	1		56,826.30	14.40				3,172	1	1	1	1	604	26,888	44.5	0.2
10270	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	MAU2	1	1		56,826.30	7.20				3,140	1	1	1	1	604	26,608	44.1	0.2
10270	VEH MAINT SHOP	MAU2	1	3			1.80				8		1		1	363	70	0.2	45.7
10270	VEH MAINT SHOP	MAU3	1	3			3.70				16		1		1	363	144	0.4	22.2
10270	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	MAU3	1	1		56,826.30	14.40				3,172	1	1	1	1	604	26,888	44.5	0.2
10270	VEH MAINT SHOP	MAU4	1	1		56,826.30	14.40				3,172	1	1	1	1	604	26,888	44.5	0.2
10270	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	MAU4	1	3			3.70				16		1		1	363	144	0.4	22.2
10270	VEH MAINT SHOP	MAU5	1	1		56,826.30	7.20				3,140	1	1	1	1	604	26,608	44.1	0.2
10270	VEH MAINT SHOP	MAU5	1	3			1.80				8		1		1	363	70	0.2	45.7
10270	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	MAU6	1	1		56,826.30	12.00				3,161	1	1	1	1	604	26,794	44.4	0.2
10270	VEH MAINT SHOP	MAU6	1	3			3.10				14		1		1	363	120	0.3	26.6
10270	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10270	VEH MAINT SHOP	MAU7	1	1		29,644.00	4.80				1,643	1	1	1	1	604	13,921	23.0	0.4
10270	VEH MAINT SHOP	MAU7	1	3			1.20				5		1		1	363	47	0.1	68.6
10400	BDE HQ BLDG	AHU1	1	3			11.40				50		1		1	363	443	1.2	7.2
10400	BDE HQ BLDG	AHU1	1	1		8,501.70	147.60				1,116	1	1	1	1	604	9,673	16.0	0.5
10400	BDE HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10400	BDE HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10400	BDE HQ BLDG	AHU2	1	1		4,791.40	28.10				386	1	1	1	1	604	3,312	5.5	1.6
10400	BDE HQ BLDG	AHU2	1	3			2.20				10		1		1	363	85	0.2	37.4
10400	BDE HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10400	BDE HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10400	BDE HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10400	BDE HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10400	BDE HQ BLDG	HE2-PER	12	3			40.90				180		1		1	472	1,589	3.4	2.6
10400	BDE HQ BLDG	HE2-PER	12	1		2,397.80	527.00				2,455	1		1	2	576	21,586	37.5	0.2
10410	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10410	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10410	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10410	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10410	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10410	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10410	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10410	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10410	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10410	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10410	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10410	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			84.80				374		1		1	363	3,295	9.1	1.0
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			84.80				374		1		1	363	3,295	9.1	1.0

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.90				61		1		1	363	540	1.5	5.9
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	115.70				602	1	1	1	1	604	5,275	8.7	1.0
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.90				61		1		1	363	540	1.5	5.9
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	115.70				602	1	1	1	1	604	5,275	8.7	1.0
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	115.70				602	1	1	1	1	604	5,275	8.7	1.0
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.90				61		1		1	363	540	1.5	5.9
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	115.70				602	1	1	1	1	604	5,275	8.7	1.0
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.90				61		1		1	363	540	1.5	5.9
10412	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10412	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10412	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			91.30				403		1		1	363	3,547	9.8	0.9
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			91.30				403		1		1	363	3,547	9.8	0.9
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			15.00				66		1		1	363	583	1.6	5.5
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	124.60				642	1	1	1	1	604	5,621	9.3	0.9
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	124.60				642	1	1	1	1	604	5,621	9.3	0.9
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			15.00				66		1		1	363	583	1.6	5.5
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	124.60				642	1	1	1	1	604	5,621	9.3	0.9
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			15.00				66		1		1	363	583	1.6	5.5
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	124.60				642	1	1	1	1	604	5,621	9.3	0.9
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			15.00				66		1		1	363	583	1.6	5.5
10414	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10414	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10414	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10414	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10414	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10420	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10420	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10420	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10420	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10420	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10420	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10420	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10420	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10420	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10420	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10420	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10420	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	97.80				523	1	1	1	1	604	4,580	7.6	1.2
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			11.70				52		1		1	363	455	1.3	7.0
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	97.80				523	1	1	1	1	604	4,580	7.6	1.2
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			11.70				52		1		1	363	455	1.3	7.0
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			11.70				52		1		1	363	455	1.3	7.0
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	97.80				523	1	1	1	1	604	4,580	7.6	1.2
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			84.50				373		1		1	363	3,283	9.0	1.0
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			84.50				373		1		1	363	3,283	9.0	1.0
10422	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10422	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10422	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10422	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10422	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10422	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10450	ENL PERS DIN	AHU1	1	3			63.00				278		1		1	363	2,448	6.7	1.3
10450	ENL PERS DIN	AHU1	1	4						3	60						512	N/A	N/A
10450	ENL PERS DIN	AHU1	1	1		14,177.20	174.40				1,545	1	1	1	1	604	13,344	22.1	0.4
10450	ENL PERS DIN	AHU2	2	3			54.70				241		1		1	363	2,125	5.9	1.5
10450	ENL PERS DIN	AHU2	2	4						3	60						512	N/A	N/A
10450	ENL PERS DIN	AHU2	2	1		15,122.30	154.40				1,508	1	1	2	1	756	13,005	17.2	0.5
10450	ENL PERS DIN	AHU3	2	3			48.30				213		1		1	363	1,877	5.2	1.7
10450	ENL PERS DIN	AHU3	2	1		18,308.00	133.60				1,591	1	1	2	1	756	13,673	18.1	0.5
10450	ENL PERS DIN	AHU3	2	4						3	60						512	N/A	N/A
10450	ENL PERS DIN	AHU4	2	3			77.20				340		1		1	363	2,999	8.3	1.1
10450	ENL PERS DIN	AHU4	2	1		27,177.00	213.80				2,429	1	1	2	1	756	20,898	27.6	0.3
10450	ENL PERS DIN	AHU4	2	4						3	60						512	N/A	N/A
10450	ENL PERS DIN	AHU5	2	1		11,550.20	89.10				1,025	1	1	2	1	756	8,813	11.7	0.7
10450	ENL PERS DIN	AHU5	2	3			32.20				142		1		1	363	1,251	3.4	2.6
10450	ENL PERS DIN	AHU5	2	4						3	60						512	N/A	N/A
10450	ENL PERS DIN	AHU6	1	4						3	60						512	N/A	N/A
10450	ENL PERS DIN	AHU6	1	3			5.10				22		1		1	363	198	0.5	16.1
10450	ENL PERS DIN	AHU6	1	1		7,181.90	14.30				456	1	1	1	1	604	3,883	6.4	1.3
10450	ENL PERS DIN	HE1	9	3			23.80				105						925	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10450	ENL PERS DIN	HE1	9	1		3,637.00	65.90				490	1		1		289	4,245	14.7	0.6
10450	ENL PERS DIN	HE1	9	4						3	60						512	N/A	N/A
10450	ENL PERS DIN	HE1	9	7			11.10				49		1		2	773	431	0.6	15.8
10470	VEH MAINT SHOP	HTP1	12	3			18.30				81		1		1	472	711	1.5	5.8
10470	VEH MAINT SHOP	HTP1	12	1		12,616.70	71.60				1,006	1		1	2	576	8,627	15.0	0.6
10470	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
10470	VEH MAINT SHOP	HTP2	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10470	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10470	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10470	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	HV1	2	3			7.60				34		1		1	363	295	0.8	10.8
10470	VEH MAINT SHOP	HV1	2	1		83,884.90	29.80				4,720	1	1	2	1	756	40,022	52.9	0.2
10470	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	HV2	2	1		101,035.00	29.80				5,658	1	1	2	1	756	47,968	63.5	0.1
10470	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	HV2	2	3			7.60				34		1		1	363	295	0.8	10.8
10470	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	HV3	2	3			7.60				34		1		1	363	295	0.8	10.8
10470	VEH MAINT SHOP	HV3	2	1		83,884.90	29.80				4,720	1	1	2	1	756	40,022	52.9	0.2
10470	VEH MAINT SHOP	HV4	2	1		83,884.90	14.90				4,654	1	1	2	1	756	39,444	52.2	0.2
10470	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	HV4	2	3			3.80				17		1		1	363	148	0.4	21.7
10470	VEH MAINT SHOP	MAU1	1	1		56,826.30	17.90				3,187	1	1	1	1	604	27,024	44.7	0.2
10470	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	MAU1	1	3			4.60				20		1		1	363	179	0.5	17.9
10470	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	MAU2	1	1		56,826.30	8.90				3,148	1	1	1	1	604	26,674	44.2	0.2
10470	VEH MAINT SHOP	MAU2	1	3			2.30				10		1		1	363	89	0.2	35.8
10470	VEH MAINT SHOP	MAU3	1	1		56,826.30	17.90				3,187	1	1	1	1	604	27,024	44.7	0.2
10470	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	MAU3	1	3			4.60				20		1		1	363	179	0.5	17.9
10470	VEH MAINT SHOP	MAU4	1	1		56,826.30	17.90				3,187	1	1	1	1	604	27,024	44.7	0.2
10470	VEH MAINT SHOP	MAU4	1	3			4.60				20		1		1	363	179	0.5	17.9
10470	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	MAU5	1	3			2.30				10		1		1	363	89	0.2	35.8
10470	VEH MAINT SHOP	MAU5	1	1		56,826.30	8.90				3,148	1	1	1	1	604	26,674	44.2	0.2
10470	VEH MAINT SHOP	MAU6	1	3			3.80				17		1		1	363	148	0.4	21.7
10470	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	MAU6	1	1		56,826.30	14.90				3,174	1	1	1	1	604	26,907	44.5	0.2
10470	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10470	VEH MAINT SHOP	MAU7	1	1		29,644.00	6.00				1,648	1	1	1	1	604	13,967	23.1	0.4
10470	VEH MAINT SHOP	MAU7	1	3			1.50				7		1		1	363	58	0.2	54.9
10480	VEH MAINT SHOP	HTP1	12	1		12,616.70	62.30				965	1		1	2	576	8,266	14.4	0.6
10480	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	HTP1	12	3			15.90				70		1		1	472	618	1.3	6.7
10480	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
10480	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10480	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10480	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10480	VEH MAINT SHOP	HV1	2	3			6.60				29		1		1	363	256	0.7	12.5
10480	VEH MAINT SHOP	HV1	2	1		83,884.90	26.00				4,703	1	1	2	1	756	39,875	52.7	0.2
10480	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	HV2	2	1		101,035.00	26.00				5,641	1	1	2	1	756	47,821	63.3	0.1
10480	VEH MAINT SHOP	HV2	2	3			6.60				29		1		1	363	256	0.7	12.5
10480	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	HV3	2	1		83,884.90	26.00				4,703	1	1	2	1	756	39,875	52.7	0.2
10480	VEH MAINT SHOP	HV3	2	3			6.60				29		1		1	363	256	0.7	12.5
10480	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	HV4	2	3			3.30				15		1		1	363	128	0.4	24.9
10480	VEH MAINT SHOP	HV4	2	1		83,884.90	13.00				4,646	1	1	2	1	756	39,370	52.1	0.2
10480	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	MAU1	1	3			4.00				18		1		1	363	155	0.4	20.6
10480	VEH MAINT SHOP	MAU1	1	1		56,826.30	15.60				3,177	1	1	1	1	604	26,934	44.6	0.2
10480	VEH MAINT SHOP	MAU2	1	3			2.00				9		1		1	363	78	0.2	41.2
10480	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	MAU2	1	1		56,826.30	7.80				3,143	1	1	1	1	604	26,631	44.1	0.2
10480	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	MAU3	1	1		56,826.30	15.60				3,177	1	1	1	1	604	26,934	44.6	0.2
10480	VEH MAINT SHOP	MAU3	1	3			4.00				18		1		1	363	155	0.4	20.6
10480	VEH MAINT SHOP	MAU4	1	3			4.00				18		1		1	363	155	0.4	20.6
10480	VEH MAINT SHOP	MAU4	1	1		56,826.30	15.60				3,177	1	1	1	1	604	26,934	44.6	0.2
10480	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	MAU5	1	3			2.00				9		1		1	363	78	0.2	41.2
10480	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	MAU5	1	1		56,826.30	7.80				3,143	1	1	1	1	604	26,631	44.1	0.2
10480	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	MAU6	1	3			3.30				15		1		1	363	128	0.4	24.9
10480	VEH MAINT SHOP	MAU6	1	1		56,826.30	13.00				3,166	1	1	1	1	604	26,833	44.4	0.2
10480	VEH MAINT SHOP	MAU7	1	3			1.30				6		1		1	363	51	0.1	63.3
10480	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10480	VEH MAINT SHOP	MAU7	1	1		29,644.00	5.20				1,644	1	1	1	1	604	13,936	23.1	0.4
10500	BDE HQ BLDG	AHU1	1	3			11.40				50		1		1	363	443	1.2	7.2
10500	BDE HQ BLDG	AHU1	1	1		8,501.70	147.60				1,116	1	1	1	1	604	9,673	16.0	0.5
10500	BDE HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10500	BDE HQ BLDG	AHU2	1	1		4,791.40	28.10				386	1	1	1	1	604	3,312	5.5	1.6
10500	BDE HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10500	BDE HQ BLDG	AHU2	1	3			2.20				10		1		1	363	85	0.2	37.4
10500	BDE HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10500	BDE HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10500	BDE HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10500	BDE HQ BLDG	HE2-PER	12	1		2,397.80	527.00				2,455	1		1	2	576	21,586	37.5	0.2
10500	BDE HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10500	BDE HQ BLDG	HE2-PER	12	3			40.90				180		1		1	472	1,589	3.4	2.6
10502	OPEN DIN CONSOL	AHU1	4	2		1,146.50					63		1		2	647	531	0.8	10.3
10502	OPEN DIN CONSOL	AHU1	4	3			32.30				142		2		1	534	1,255	2.4	3.7
10502	OPEN DIN CONSOL	AHU1	4	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10502	OPEN DIN CONSOL	AHU1	4	1	4.7	9,855.20	87.50				957	1		2	1	584	8,241	14.1	0.6
10502	OPEN DIN CONSOL	AHU2	3	2		2,063.70					113						956	N/A	N/A
10502	OPEN DIN CONSOL	AHU2	3	4						3	60						512	N/A	N/A
10502	OPEN DIN CONSOL	AHU2	3	3			56.10				247		2		1	534	2,180	4.1	2.2
10502	OPEN DIN CONSOL	AHU2	3	1	10.8	3,223.10	196.70				1,118	1	1	1	1	604	9,769	16.2	0.5
10502	OPEN DIN CONSOL	AHU3	3	3			77.60				342		2		1	534	3,015	5.6	1.6
10502	OPEN DIN CONSOL	AHU3	3	1	10.8	23,506.40	210.00				2,286	1	1	1	1	604	19,683	32.6	0.3
10502	OPEN DIN CONSOL	AHU3	3	2		2,797.50					153						1,296	N/A	N/A
10502	OPEN DIN CONSOL	AHU3	3	4						3	60						512	N/A	N/A
10502	OPEN DIN CONSOL	AHU4	3	4						3	60						512	N/A	N/A
10502	OPEN DIN CONSOL	AHU4	3	1	10.8	18,468.20	174.20				1,853	1	1	1	1	604	15,958	26.4	0.3
10502	OPEN DIN CONSOL	AHU4	3	2		1,834.40					100						850	N/A	N/A
10502	OPEN DIN CONSOL	AHU4	3	3			49.60				219		2		1	534	1,927	3.6	2.4
10502	OPEN DIN CONSOL	B1	10	4						3	60						512	N/A	N/A
10502	OPEN DIN CONSOL	B1	10	7				7.60			32				2	602	310	0.5	18.6
10502	OPEN DIN CONSOL	B1	10	1		4,741.30					259	1		2		383	2,197	5.7	1.5
10502	OPEN DIN CONSOL	B2	10	1		4,741.30					259	1		2		383	2,197	5.7	1.5
10502	OPEN DIN CONSOL	B2	10	4						3	60						512	N/A	N/A
10502	OPEN DIN CONSOL	B2	10	7				7.60			32				2	602	310	0.5	18.6
10502	OPEN DIN CONSOL	B3	10	1		4,741.30					259	1		2		383	2,197	5.7	1.5
10502	OPEN DIN CONSOL	B3	10	4						3	60						512	N/A	N/A
10502	OPEN DIN CONSOL	B3	10	7				7.60			32				2	602	310	0.5	18.6
10502	OPEN DIN CONSOL	WC1	8	4						3	60				2	602	512	0.9	10.0
10502	OPEN DIN CONSOL	WC1	8	1	10.8	10,809.90					666	2		2		578	5,642	9.8	0.9
10502	OPEN DIN CONSOL	WC1	8	6		698.60					38						324	N/A	N/A
10506	CLINICS W/O BEDS	ACCU-1	11	4						3	60						512	N/A	N/A
10506	CLINICS W/O BEDS	ACCU-1	11	1	4.5	5,046.70					307	1		1		289	2,602	9.0	0.9
10506	CLINICS W/O BEDS	AHU1	3	1	10.8	79,068.10	71.50				4,715	1	1	1	1	604	40,045	66.3	0.1
10506	CLINICS W/O BEDS	AHU1	3	3		13,613.80	10.50				791		2		1	534	6,715	12.6	0.7
10506	CLINICS W/O BEDS	AHU1	3	4						3	60						512	N/A	N/A
10506	CLINICS W/O BEDS	HE1	12	4						3	60						512	N/A	N/A
10506	CLINICS W/O BEDS	HE1	12	1		2,375.80	405.40				1,918	1		1	2	576	16,851	29.3	0.3
10506	CLINICS W/O BEDS	HE1	12	7			3.40				15						132	N/A	N/A
10506	CLINICS W/O BEDS	HE2	9	7			1.40				6		1		2	773	54	0.1	125.2
10506	CLINICS W/O BEDS	HE2	9	4						3	60						512	N/A	N/A
10506	CLINICS W/O BEDS	HE2	9	1		2,975.50					163	1		1		289	1,379	4.8	1.8
10510	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10510	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10510	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10510	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10510	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10510	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10510	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10510	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10510	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10510	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10510	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10510	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			80.70				356		1		1	363	3,135	8.6	1.0

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			80.70				356		1		1	363	3,135	8.6	1.0
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.20				58		1		1	363	513	1.4	6.2
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	110.20				578	1	1	1	1	604	5,061	8.4	1.0
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.20				58		1		1	363	513	1.4	6.2
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	110.20				578	1	1	1	1	604	5,061	8.4	1.0
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.20				58		1		1	363	513	1.4	6.2
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	110.20				578	1	1	1	1	604	5,061	8.4	1.0
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.20				58		1		1	363	513	1.4	6.2
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	110.20				578	1	1	1	1	604	5,061	8.4	1.0
10512	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10512	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10512	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10512	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	94.50				509	1	1	1	1	604	4,451	7.4	1.2
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			11.30				50		1		1	363	439	1.2	7.3
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	94.50				509	1	1	1	1	604	4,451	7.4	1.2
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			11.30				50		1		1	363	439	1.2	7.3
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			11.30				50		1		1	363	439	1.2	7.3
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	94.50				509	1	1	1	1	604	4,451	7.4	1.2
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			81.70				360		1		1	363	3,174	8.7	1.0
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10514	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			81.70				360		1		1	363	3,174	8.7	1.0
10514	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10514	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10514	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10514	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10514	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10520	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10520	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10520	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10520	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10520	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10520	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10520	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10520	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10520	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10520	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10520	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10520	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			10.90				48		1		1	363	423	1.2	7.6
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			10.90				48		1		1	363	423	1.2	7.6
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	101.60				540	1	1	1	1	604	4,727	7.8	1.1
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			10.90				48		1		1	363	423	1.2	7.6
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			78.40				346		1		1	363	3,046	8.4	1.0
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10522	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			78.40				346		1		1	363	3,046	8.4	1.0
10522	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10522	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10522	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10522	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	1		129.40					7	1		1		289	60	0.2	40.8
10522	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10522	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	94.60				509	1	1	1	1	604	4,455	7.4	1.2
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			11.40				50		1		1	363	443	1.2	7.2
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			11.40				50		1		1	363	443	1.2	7.2
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	94.60				509	1	1	1	1	604	4,455	7.4	1.2
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	94.60				509	1	1	1	1	604	4,455	7.4	1.2
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			11.40				50		1		1	363	443	1.2	7.2
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			81.70				360		1		1	363	3,174	8.7	1.0
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10524	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			81.70				360		1		1	363	3,174	8.7	1.0
10524	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10524	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10524	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10524	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10524	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10550	ENL PERS DIN	AHU-1	3	3			146.20				645		2		1	534	5,680	10.6	0.8
10550	ENL PERS DIN	AHU-1	3	1		5,386.40	404.80				2,080	1	1	1	1	604	18,223	30.2	0.3
10550	ENL PERS DIN	AHU-1	3	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU1	1	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU1	1	1		12,801.70	174.40				1,469	1	1	1	1	604	12,707	21.0	0.4
10550	ENL PERS DIN	AHU1	1	3			63.00				278		1		1	363	2,448	6.7	1.3
10550	ENL PERS DIN	AHU-2	3	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU-2	3	1		7,181.90	267.40				1,572	1	1	1	1	604	13,716	22.7	0.4
10550	ENL PERS DIN	AHU-2	3	3			96.60				426		2		1	534	3,753	7.0	1.3

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10550	ENL PERS DIN	AHU2	2	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU2	2	3			89.70				396		1		1	363	3,485	9.6	0.9
10550	ENL PERS DIN	AHU2	2	1		15,122.30	248.40				1,923	1	1	2	1	756	16,657	22.0	0.4
10550	ENL PERS DIN	AHU-3	3	1		4,027.80	118.40				742	1	1	1	1	604	6,466	10.7	0.8
10550	ENL PERS DIN	AHU-3	3	3			42.80				189		2		1	534	1,663	3.1	2.8
10550	ENL PERS DIN	AHU-3	3	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU3	2	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU3	2	3			79.20				349		1		1	363	3,077	8.5	1.0
10550	ENL PERS DIN	AHU3	2	1		18,308.00	219.20				1,968	1	1	2	1	756	16,999	22.5	0.4
10550	ENL PERS DIN	AHU-4	3	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU-4	3	3			84.50				373		2		1	534	3,283	6.1	1.4
10550	ENL PERS DIN	AHU-4	3	1		7,181.90	233.80				1,424	1	1	1	1	604	12,411	20.5	0.4
10550	ENL PERS DIN	AHU4	2	1		27,177.00	350.70				3,033	1	1	2	1	756	26,217	34.7	0.2
10550	ENL PERS DIN	AHU4	2	3			126.70				559		1		1	363	4,923	13.6	0.6
10550	ENL PERS DIN	AHU4	2	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU5	2	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU5	2	3			52.80				233		1		1	363	2,051	5.7	1.6
10550	ENL PERS DIN	AHU5	2	1		11,550.20	146.10				1,276	1	1	2	1	756	11,028	14.6	0.6
10550	ENL PERS DIN	AHU-6	3	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU-6	3	1		1,208.30	30.70				201	1	1	1	1	604	1,753	2.9	3.0
10550	ENL PERS DIN	AHU-6	3	3			11.10				49		2		1	534	431	0.8	10.9
10550	ENL PERS DIN	AHU6	1	3			8.40				37		1		1	363	326	0.9	9.8
10550	ENL PERS DIN	AHU6	1	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	AHU6	1	1		7,181.90	23.40				496	1	1	1	1	604	4,237	7.0	1.2
10550	ENL PERS DIN	FTR-1	12	1		2,343.10	109.10				609	1		1	2	576	5,324	9.2	0.9
10550	ENL PERS DIN	FTR-1	12	7			11.10				49						431	N/A	N/A
10550	ENL PERS DIN	FTR-1	12	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	FTR-1	12	3			39.60				175		1		1	472	1,539	3.3	2.7
10550	ENL PERS DIN	HE1	9	3			39.10				172						1,519	N/A	N/A
10550	ENL PERS DIN	HE1	9	7			11.10				49		1		2	773	431	0.6	15.8
10550	ENL PERS DIN	HE1	9	4						3	60						512	N/A	N/A
10550	ENL PERS DIN	HE1	9	1		3,637.00	108.10				676	1		1		289	5,885	20.4	0.4
10570	VEH MAINT SHOP	HTP1	12	1		12,616.70	57.40				943	1		1	2	576	8,076	14.0	0.6
10570	VEH MAINT SHOP	HTP1	12	3			14.70				65		1		1	472	571	1.2	7.3
10570	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
10570	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
10570	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10570	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10570	VEH MAINT SHOP	HV1	2	3			6.10				27		1		1	363	237	0.7	13.5
10570	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	HV1	2	1		83,884.90	23.90				4,694	1	1	2	1	756	39,793	52.6	0.2
10570	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	HV2	2	1		101,035.00	23.90				5,632	1	1	2	1	756	47,739	63.1	0.1
10570	VEH MAINT SHOP	HV2	2	3			6.10				27		1		1	363	237	0.7	13.5
10570	VEH MAINT SHOP	HV3	2	1		83,884.90	23.90				4,694	1	1	2	1	756	39,793	52.6	0.2
10570	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	HV3	2	3			6.10				27		1		1	363	237	0.7	13.5
10570	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10570	VEH MAINT SHOP	HV4	2	1		83,884.90	12.00				4,641	1	1	2	1	756	39,331	52.0	0.2
10570	VEH MAINT SHOP	HV4	2	3			3.10				14		1		1	363	120	0.3	26.6
10570	VEH MAINT SHOP	MAU1	1	1		56,826.30	14.30				3,171	1	1	1	1	604	26,884	44.5	0.2
10570	VEH MAINT SHOP	MAU1	1	3			3.70				16		1		1	363	144	0.4	22.2
10570	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	MAU2	1	3			1.80				8		1		1	363	70	0.2	45.7
10570	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	MAU2	1	1		56,826.30	7.20				3,140	1	1	1	1	604	26,608	44.1	0.2
10570	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	MAU3	1	1		56,826.30	14.30				3,171	1	1	1	1	604	26,884	44.5	0.2
10570	VEH MAINT SHOP	MAU3	1	3			3.70				16		1		1	363	144	0.4	22.2
10570	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	MAU4	1	3			3.70				16		1		1	363	144	0.4	22.2
10570	VEH MAINT SHOP	MAU4	1	1		56,826.30	14.30				3,171	1	1	1	1	604	26,884	44.5	0.2
10570	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	MAU5	1	1		56,826.30	7.20				3,140	1	1	1	1	604	26,608	44.1	0.2
10570	VEH MAINT SHOP	MAU5	1	3			1.80				8		1		1	363	70	0.2	45.7
10570	VEH MAINT SHOP	MAU6	1	1		56,826.30	12.00				3,161	1	1	1	1	604	26,794	44.4	0.2
10570	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	MAU6	1	3			3.10				14		1		1	363	120	0.3	26.6
10570	VEH MAINT SHOP	MAU7	1	3			1.20				5		1		1	363	47	0.1	68.6
10570	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10570	VEH MAINT SHOP	MAU7	1	1		29,644.00	4.80				1,643	1	1	1	1	604	13,921	23.0	0.4
10580	VEH MAINT SHOP	HTP1	12	1		12,616.70	60.70				958	1		1	2	576	8,204	14.2	0.6
10580	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	HTP1	12	3			15.50				68		1		1	472	602	1.3	6.9
10580	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
10580	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
10580	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10580	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10580	VEH MAINT SHOP	HV1	2	3			6.50				29		1		1	363	253	0.7	12.7
10580	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	HV1	2	1		83,884.90	25.30				4,700	1	1	2	1	756	39,848	52.7	0.2
10580	VEH MAINT SHOP	HV2	2	1		101,035.00	25.30				5,638	1	1	2	1	756	47,793	63.2	0.1
10580	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	HV2	2	3			6.50				29		1		1	363	253	0.7	12.7
10580	VEH MAINT SHOP	HV3	2	3			6.50				29		1		1	363	253	0.7	12.7
10580	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	HV3	2	1		83,884.90	25.30				4,700	1	1	2	1	756	39,848	52.7	0.2
10580	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	HV4	2	3			3.20				14		1		1	363	124	0.3	25.7
10580	VEH MAINT SHOP	HV4	2	1		83,884.90	12.60				4,644	1	1	2	1	756	39,354	52.1	0.2
10580	VEH MAINT SHOP	MAU1	1	3			3.90				17		1		1	363	152	0.4	21.1
10580	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	MAU1	1	1		56,826.30	15.20				3,175	1	1	1	1	604	26,919	44.6	0.2
10580	VEH MAINT SHOP	MAU2	1	1		56,826.30	7.60				3,142	1	1	1	1	604	26,623	44.1	0.2
10580	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	MAU2	1	3			1.90				8		1		1	363	74	0.2	43.3
10580	VEH MAINT SHOP	MAU3	1	1		56,826.30	15.20				3,175	1	1	1	1	604	26,919	44.6	0.2

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10580	VEH MAINT SHOP	MAU3	1	3			3.90				17		1		1	363	152	0.4	21.1
10580	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	MAU4	1	1		56,826.30	15.20				3,175	1	1	1	1	604	26,919	44.6	0.2
10580	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	MAU4	1	3			3.90				17		1		1	363	152	0.4	21.1
10580	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	MAU5	1	3			1.90				8		1		1	363	74	0.2	43.3
10580	VEH MAINT SHOP	MAU5	1	1		56,826.30	7.60				3,142	1	1	1	1	604	26,623	44.1	0.2
10580	VEH MAINT SHOP	MAU6	1	1		56,826.30	12.60				3,164	1	1	1	1	604	26,818	44.4	0.2
10580	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	MAU6	1	3			3.20				14		1		1	363	124	0.3	25.7
10580	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10580	VEH MAINT SHOP	MAU7	1	3			1.30				6		1		1	363	51	0.1	63.3
10580	VEH MAINT SHOP	MAU7	1	1		29,644.00	5.10				1,644	1	1	1	1	604	13,932	23.1	0.4
10610	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10610	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10610	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10610	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10610	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10610	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10610	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10610	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10610	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10610	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10610	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10610	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			83.20				367		1		1	363	3,232	8.9	1.0
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			83.20				367		1		1	363	3,232	8.9	1.0
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	113.60				593	1	1	1	1	604	5,193	8.6	1.0
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.60				60		1		1	363	528	1.5	6.1
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.60				60		1		1	363	528	1.5	6.1
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	113.60				593	1	1	1	1	604	5,193	8.6	1.0
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	113.60				593	1	1	1	1	604	5,193	8.6	1.0
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.60				60		1		1	363	528	1.5	6.1
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	113.60				593	1	1	1	1	604	5,193	8.6	1.0
10612	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.60				60		1		1	363	528	1.5	6.1
10612	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10612	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10612	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10612	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10612	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	103.10				547	1	1	1	1	604	4,786	7.9	1.1
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			11.00				49		1		1	363	427	1.2	7.5
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	103.10				547	1	1	1	1	604	4,786	7.9	1.1
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			11.00				49		1		1	363	427	1.2	7.5
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			11.00				49		1		1	363	427	1.2	7.5
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	103.10				547	1	1	1	1	604	4,786	7.9	1.1
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			79.50				351		1		1	363	3,089	8.5	1.0
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			79.50				351		1		1	363	3,089	8.5	1.0
10614	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10614	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10614	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10614	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10614	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10614	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10620	BN HQ BLDG	AHU1	1	3			13.40				59		1		1	363	521	1.4	6.1
10620	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10620	BN HQ BLDG	AHU1	1	1		8,501.70	173.50				1,230	1	1	1	1	604	10,680	17.7	0.5
10620	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10620	BN HQ BLDG	AHU2	1	3			2.60				11		1		1	363	101	0.3	31.7
10620	BN HQ BLDG	AHU2	1	1		4,791.40	33.00				408	1	1	1	1	604	3,502	5.8	1.5
10620	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10620	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10620	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10620	BN HQ BLDG	HE2-PER	12	1		2,397.80	619.60				2,864	1		1	2	576	25,184	43.7	0.2
10620	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10620	BN HQ BLDG	HE2-PER	12	3			48.00				212		1		1	472	1,865	4.0	2.2
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			81.90				361		1		1	363	3,182	8.8	1.0
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			81.90				361		1		1	363	3,182	8.8	1.0
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	111.80				585	1	1	1	1	604	5,124	8.5	1.0
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.40				59		1		1	363	521	1.4	6.1
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	111.80				585	1	1	1	1	604	5,124	8.5	1.0
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.40				59		1		1	363	521	1.4	6.1
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.40				59		1		1	363	521	1.4	6.1
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	111.80				585	1	1	1	1	604	5,124	8.5	1.0
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	111.80				585	1	1	1	1	604	5,123	8.5	1.0
10622	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.40				59		1		1	363	521	1.4	6.1
10622	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10622	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10622	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10622	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10630	BN HQ BLDG	AHU1	1	1		8,501.70	166.40				1,199	1	1	1	1	604	10,404	17.2	0.5
10630	BN HQ BLDG	AHU1	1	3			12.90				57		1		1	363	501	1.4	6.4
10630	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10630	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10630	BN HQ BLDG	AHU2	1	1		4,791.40	28.00				386	1	1	1	1	604	3,308	5.5	1.6
10630	BN HQ BLDG	AHU2	1	3			2.20				10		1		1	363	85	0.2	37.4
10630	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10630	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10630	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10630	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10630	BN HQ BLDG	HE2-PER	12	1		2,397.60	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10630	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-1	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-10	1	3			83.20				367		1		1	363	3,232	8.9	1.0
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	3			83.20				367		1		1	363	3,232	8.9	1.0
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-11	1	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-2	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-3	14	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-4	14	1		5,092.00					279	1		1	1	433	2,359	5.4	1.6
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			13.10				58		1		1	363	509	1.4	6.3
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	3			13.10				58		1		1	363	509	1.4	6.3
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-7	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	3			13.10				58		1		1	363	509	1.4	6.3
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	1		1,683.30	109.20				574	1	1	1	1	604	5,023	8.3	1.1
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-8	1	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	4						3	60						512	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	3			13.10				58		1		1	363	509	1.4	6.3
10632	ENL BK W/O DIN + ADM & SUPPL	AHU-9	1	1		1,683.00	109.20				574	1	1	1	1	604	5,022	8.3	1.1
10632	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			3.80				17		1		2	773	148	0.2	46.1
10632	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	7			7.30				32						284	N/A	N/A
10632	ENL BK W/O DIN + ADM & SUPPL	HE-1	12	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10632	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10632	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10640	BN HQ BLDG	AHU1	1	1		8,501.70	163.30				1,185	1	1	1	1	604	10,283	17.0	0.5
10640	BN HQ BLDG	AHU1	1	4						3	60						512	N/A	N/A
10640	BN HQ BLDG	AHU1	1	3			12.70				56		1		1	363	493	1.4	6.5
10640	BN HQ BLDG	AHU2	1	3			2.40				11		1		1	363	93	0.3	34.3
10640	BN HQ BLDG	AHU2	1	1		4,791.40	31.10				399	1	1	1	1	604	3,428	5.7	1.5
10640	BN HQ BLDG	AHU2	1	4						3	60						512	N/A	N/A
10640	BN HQ BLDG	HE1	9	4						3	60						512	N/A	N/A
10640	BN HQ BLDG	HE1	9	7			1.90				8		1		2	773	74	0.1	92.3
10640	BN HQ BLDG	HE1	9	1		5,328.60					291	1		1		289	2,469	8.5	1.0
10640	BN HQ BLDG	HE2-PER	12	1		2,397.80	583.30				2,704	1		1	2	576	23,773	41.3	0.2
10640	BN HQ BLDG	HE2-PER	12	3			45.20				199		1		1	472	1,756	3.7	2.4
10640	BN HQ BLDG	HE2-PER	12	4						3	60						512	N/A	N/A
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			10.90				48		1		1	363	423	1.2	7.6
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	101.40				539	1	1	1	1	604	4,719	7.8	1.1
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			10.90				48		1		1	363	423	1.2	7.6
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	101.40				539	1	1	1	1	604	4,719	7.8	1.1
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			10.90				48		1		1	363	423	1.2	7.6
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	101.40				539	1	1	1	1	604	4,719	7.8	1.1
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			78.20				345		1		1	363	3,038	8.4	1.1
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			78.20				345		1		1	363	3,038	8.4	1.1
10642	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10642	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10642	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10642	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10642	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10642	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	4						3	60						512	N/A	N/A
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	1		1,683.30	84.50				465	1	1	1	1	604	4,063	6.7	1.3
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-1	1	3			10.10				45		1		1	363	392	1.1	8.1
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	4						3	60						512	N/A	N/A
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	1		1,683.30	84.50				465	1	1	1	1	604	4,063	6.7	1.3
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-2	1	3			10.10				45		1		1	363	392	1.1	8.1
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	3			10.10				45		1		1	363	392	1.1	8.1
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	1		1,683.30	84.50				465	1	1	1	1	604	4,063	6.7	1.3
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-4	1	4						3	60						512	N/A	N/A
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	4						3	60						512	N/A	N/A
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-5	1	3			73.00				322		1		1	363	2,836	7.8	1.1
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	3			73.00				322		1		1	363	2,836	7.8	1.1
10644	ENL BK W/O DIN + ADM & SUPPL	AHU-6	1	4						3	60						512	N/A	N/A
10644	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	1		287.50					16	1		1		289	133	0.5	18.4
10644	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	4						3	60						512	N/A	N/A
10644	ENL BK W/O DIN + ADM & SUPPL	HE-1	9	7			2.90				13		1		2	773	113	0.1	60.4
10644	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	4						3	60						512	N/A	N/A
10644	ENL BK W/O DIN + ADM & SUPPL	HE-2	9	7			4.90				22		1		2	773	190	0.2	35.8
10650	ENL PERS DIN	AHU1	1	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10650	ENL PERS DIN	AHU1	1	3			63.00				278		1		1	363	2,448	6.7	1.3
10650	ENL PERS DIN	AHU1	1	1		12,801.70	174.40				1,469	1	1	1	1	604	12,707	21.0	0.4
10650	ENL PERS DIN	AHU2	2	3			72.50				320		1		1	363	2,817	7.8	1.1
10650	ENL PERS DIN	AHU2	2	1		15,122.30	200.80				1,713	1	1	2	1	756	14,808	19.6	0.4
10650	ENL PERS DIN	AHU2	2	4						3	60						512	N/A	N/A
10650	ENL PERS DIN	AHU3	2	1		18,308.00	177.20				1,783	1	1	2	1	756	15,367	20.3	0.4
10650	ENL PERS DIN	AHU3	2	4						3	60						512	N/A	N/A
10650	ENL PERS DIN	AHU3	2	3			64.00				282		1		1	363	2,487	6.8	1.3
10650	ENL PERS DIN	AHU4	2	1		27,177.00	283.50				2,737	1	1	2	1	756	23,606	31.2	0.3
10650	ENL PERS DIN	AHU4	2	4						3	60						512	N/A	N/A
10650	ENL PERS DIN	AHU4	2	3			102.40				452		1		1	363	3,978	11.0	0.8
10650	ENL PERS DIN	AHU5	2	4						3	60						512	N/A	N/A
10650	ENL PERS DIN	AHU5	2	1		11,550.20	118.10				1,153	1	1	2	1	756	9,940	13.1	0.7
10650	ENL PERS DIN	AHU5	2	3			42.70				188		1		1	363	1,659	4.6	1.9
10650	ENL PERS DIN	AHU6	1	3			6.80				30		1		1	363	264	0.7	12.1
10650	ENL PERS DIN	AHU6	1	1		7,181.90	18.90				476	1	1	1	1	604	4,062	6.7	1.3
10650	ENL PERS DIN	AHU6	1	4						3	60						512	N/A	N/A
10650	ENL PERS DIN	HE1	9	4						3	60						512	N/A	N/A
10650	ENL PERS DIN	HE1	9	3			31.60				139						1,228	N/A	N/A
10650	ENL PERS DIN	HE1	9	7			11.10				49		1		2	773	431	0.6	15.8
10650	ENL PERS DIN	HE1	9	1		3,637.00	87.40				584	1		1		289	5,081	17.6	0.5
10660	VEH MAINT SHOP	HTP1	12	3			23.80				105		1		1	472	925	2.0	4.5
10660	VEH MAINT SHOP	HTP1	12	1		12,617.00	93.30				1,102	1		1	2	576	9,470	16.4	0.5
10660	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
10660	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
10660	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10660	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10660	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	HV1	2	1		83,884.90	38.90				4,760	1	1	2	1	756	40,376	53.4	0.2
10660	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	HV1	2	3			9.90				44		1		1	363	385	1.1	8.3
10660	VEH MAINT SHOP	HV2	2	3			9.90				44		1		1	363	385	1.1	8.3
10660	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	HV2	2	1		101,035.00	38.90				5,698	1	1	2	1	756	48,322	63.9	0.1
10660	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	HV3	2	1		83,884.90	38.90				4,760	1	1	2	1	756	40,376	53.4	0.2
10660	VEH MAINT SHOP	HV3	2	3			9.90				44		1		1	363	385	1.1	8.3
10660	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	HV4	2	1		83,884.90	19.40				4,674	1	1	2	1	756	39,618	52.4	0.2
10660	VEH MAINT SHOP	HV4	2	3			5.00				22		1		1	363	194	0.5	16.5
10660	VEH MAINT SHOP	MAU1	1	1		56,826.30	23.30				3,211	1	1	1	1	604	27,233	45.1	0.2
10660	VEH MAINT SHOP	MAU1	1	3			6.00				26		1		1	363	233	0.6	13.7
10660	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	MAU2	1	1		56,826.30	11.70				3,160	1	1	1	1	604	26,783	44.3	0.2
10660	VEH MAINT SHOP	MAU2	1	3			3.00				13		1		1	363	117	0.3	27.4
10660	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	MAU3	1	3			6.00				26		1		1	363	233	0.6	13.7
10660	VEH MAINT SHOP	MAU3	1	1		56,826.30	23.30				3,211	1	1	1	1	604	27,233	45.1	0.2

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10660	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	MAU4	1	1		56,826.30	23.30				3,211	1	1	1	1	604	27,233	45.1	0.2
10660	VEH MAINT SHOP	MAU4	1	3			6.00				26		1		1	363	233	0.6	13.7
10660	VEH MAINT SHOP	MAU5	1	1		56,826.30	11.70				3,160	1	1	1	1	604	26,783	44.3	0.2
10660	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	MAU5	1	3			3.00				13		1		1	363	117	0.3	27.4
10660	VEH MAINT SHOP	MAU6	1	1		56,826.30	19.40				3,194	1	1	1	1	604	27,082	44.8	0.2
10660	VEH MAINT SHOP	MAU6	1	3			5.00				22		1		1	363	194	0.5	16.5
10660	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	MAU7	1	1		29,644.00	7.80				1,656	1	1	1	1	604	14,037	23.2	0.4
10660	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10660	VEH MAINT SHOP	MAU7	1	3			2.00				9		1		1	363	78	0.2	41.2
10670	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	HTP1	12	1		12,616.70	96.70				1,117	1		1	2	576	9,602	16.7	0.5
10670	VEH MAINT SHOP	HTP1	12	3			24.70				109		1		1	472	960	2.0	4.3
10670	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
10670	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
10670	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10670	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10670	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	HV1	2	1		83,884.90	40.30				4,766	1	1	2	1	756	40,430	53.5	0.2
10670	VEH MAINT SHOP	HV1	2	3			10.30				45		1		1	363	400	1.1	8.0
10670	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	HV2	2	3			10.30				45		1		1	363	400	1.1	8.0
10670	VEH MAINT SHOP	HV2	2	1		101,035.00	40.30				5,704	1	1	2	1	756	48,376	64.0	0.1
10670	VEH MAINT SHOP	HV3	2	1		83,884.90	40.30				4,766	1	1	2	1	756	40,430	53.5	0.2
10670	VEH MAINT SHOP	HV3	2	3			10.30				45		1		1	363	400	1.1	8.0
10670	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	HV4	2	3			5.10				22		1		1	363	198	0.5	16.1
10670	VEH MAINT SHOP	HV4	2	1		83,884.90	20.10				4,677	1	1	2	1	756	39,646	52.4	0.2
10670	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	MAU1	1	3			6.20				27		1		1	363	241	0.7	13.3
10670	VEH MAINT SHOP	MAU1	1	1		56,826.30	24.20				3,215	1	1	1	1	604	27,268	45.1	0.2
10670	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	MAU2	1	1		56,826.30	12.10				3,162	1	1	1	1	604	26,798	44.4	0.2
10670	VEH MAINT SHOP	MAU2	1	3			3.10				14		1		1	363	120	0.3	26.6
10670	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	MAU3	1	3			6.20				27		1		1	363	241	0.7	13.3
10670	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	MAU3	1	1		56,826.30	24.20				3,215	1	1	1	1	604	27,268	45.1	0.2
10670	VEH MAINT SHOP	MAU4	1	3			6.20				27		1		1	363	241	0.7	13.3
10670	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	MAU4	1	1		56,826.30	24.20				3,215	1	1	1	1	604	27,268	45.1	0.2
10670	VEH MAINT SHOP	MAU5	1	3			3.10				14		1		1	363	120	0.3	26.6
10670	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	MAU5	1	1		56,826.30	12.10				3,162	1	1	1	1	604	26,798	44.4	0.2
10670	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	MAU6	1	3			5.10				22		1		1	363	198	0.5	16.1
10670	VEH MAINT SHOP	MAU6	1	1		56,826.30	20.10				3,197	1	1	1	1	604	27,109	44.9	0.2

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10670	VEH MAINT SHOP	MAU7	1	1		29,644.00	8.10				1,657	1	1	1	1	604	14,049	23.3	0.4
10670	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10670	VEH MAINT SHOP	MAU7	1	3			2.10				9		1		1	363	82	0.2	39.2
10680	VEH MAINT SHOP	HTP1	12	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	HTP1	12	3			22.50				99		1		1	472	874	1.9	4.8
10680	VEH MAINT SHOP	HTP1	12	1		12,616.70	88.20				1,079	1		1	2	576	9,272	16.1	0.5
10680	VEH MAINT SHOP	HTP2	9	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	HTP2	9	7			34.20				151		1		2	773	1,329	1.7	5.1
10680	VEH MAINT SHOP	HTP2	9	1		12,617.00					690	1		1		289	5,846	20.2	0.4
10680	VEH MAINT SHOP	HTP3	9	1		12,616.70					690	1		1		289	5,845	20.2	0.4
10680	VEH MAINT SHOP	HTP3	9	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	HTP3	9	7			31.50				139		1		2	773	1,224	1.6	5.6
10680	VEH MAINT SHOP	HV1	2	3			9.40				41		1		1	363	365	1.0	8.8
10680	VEH MAINT SHOP	HV1	2	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	HV1	2	1		83,884.90	36.70				4,750	1	1	2	1	756	40,291	53.3	0.2
10680	VEH MAINT SHOP	HV2	2	3			9.40				41		1		1	363	365	1.0	8.8
10680	VEH MAINT SHOP	HV2	2	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	HV2	2	1		101,035.00	36.70				5,688	1	1	2	1	756	48,236	63.8	0.1
10680	VEH MAINT SHOP	HV3	2	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	HV3	2	3			9.40				41		1		1	363	365	1.0	8.8
10680	VEH MAINT SHOP	HV3	2	1		83,884.90	36.70				4,750	1	1	2	1	756	40,291	53.3	0.2
10680	VEH MAINT SHOP	HV4	2	3			4.70				21		1		1	363	183	0.5	17.5
10680	VEH MAINT SHOP	HV4	2	1		83,884.90	18.40				4,670	1	1	2	1	756	39,580	52.4	0.2
10680	VEH MAINT SHOP	HV4	2	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	MAU1	1	1		56,826.30	22.00				3,205	1	1	1	1	604	27,183	45.0	0.2
10680	VEH MAINT SHOP	MAU1	1	3			5.60				25		1		1	363	218	0.6	14.7
10680	VEH MAINT SHOP	MAU1	1	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	MAU2	1	1		56,826.30	11.00				3,157	1	1	1	1	604	26,756	44.3	0.2
10680	VEH MAINT SHOP	MAU2	1	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	MAU2	1	3			2.80				12		1		1	363	109	0.3	29.4
10680	VEH MAINT SHOP	MAU3	1	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	MAU3	1	3			5.60				25		1		1	363	218	0.6	14.7
10680	VEH MAINT SHOP	MAU3	1	1		56,826.30	22.00				3,205	1	1	1	1	604	27,183	45.0	0.2
10680	VEH MAINT SHOP	MAU4	1	1		56,826.30	22.00				3,205	1	1	1	1	604	27,183	45.0	0.2
10680	VEH MAINT SHOP	MAU4	1	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	MAU4	1	3			5.60				25		1		1	363	218	0.6	14.7
10680	VEH MAINT SHOP	MAU5	1	3			2.80				12		1		1	363	109	0.3	29.4
10680	VEH MAINT SHOP	MAU5	1	1		56,826.30	11.00				3,157	1	1	1	1	604	26,756	44.3	0.2
10680	VEH MAINT SHOP	MAU5	1	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	MAU6	1	3			4.70				21		1		1	363	183	0.5	17.5
10680	VEH MAINT SHOP	MAU6	1	1		56,826.30	18.40				3,190	1	1	1	1	604	27,043	44.8	0.2
10680	VEH MAINT SHOP	MAU6	1	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	MAU7	1	3			1.90				8		1		1	363	74	0.2	43.3
10680	VEH MAINT SHOP	MAU7	1	4						3	60						512	N/A	N/A
10680	VEH MAINT SHOP	MAU7	1	1		29,644.00	7.30				1,654	1	1	1	1	604	14,018	23.2	0.4
10690	ADP BUILDING	AC-1	3	4						3	60						512	N/A	N/A
10690	ADP BUILDING	AC-1	3	1		5,095.10					279	1	1	1	1	604	2,361	3.9	2.2
10690	ADP BUILDING	AC-3	3	1		5,095.10					279	1	1	1	1	604	2,361	3.9	2.2
10690	ADP BUILDING	AC-3	3	4						3	60						512	N/A	N/A
10690	ADP BUILDING	AC-5	3	1		5,095.10					279	1	1	1	1	604	2,361	3.9	2.2
10690	ADP BUILDING	AC-5	3	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10690	ADP BUILDING	AC-7	3	1		3,468.10					190	1	1	1	1	604	1,607	2.7	3.2
10690	ADP BUILDING	AC-7	3	4						3	60						512	N/A	N/A
10690	ADP BUILDING	AC-8	3	1		3,468.10					190	1	1	1	1	604	1,607	2.7	3.2
10690	ADP BUILDING	AC-8	3	4						3	60						512	N/A	N/A
10690	ADP BUILDING	AC-9	3	1		8,195.20					448	1	1	1	1	604	3,797	6.3	1.3
10690	ADP BUILDING	AC-9	3	4						3	60						512	N/A	N/A
10690	ADP BUILDING	AHU-1	4	4						3	60						512	N/A	N/A
10690	ADP BUILDING	AHU-1	4	3			100.00				441		2		1	534	3,885	7.3	1.2
10690	ADP BUILDING	AHU-1	4	1	27.1	71,785.00	687.20				7,144	1		2	1	584	61,548	105.4	0.1
10690	ADP BUILDING	CU-1	11	4						3	60						512	N/A	N/A
10690	ADP BUILDING	CU-1	11	6		242.10					13						112	N/A	N/A
10690	ADP BUILDING	DC-1	11	4						3	60						512	N/A	N/A
10690	ADP BUILDING	DC-1	11	6		303.80					17						141	N/A	N/A
10690	ADP BUILDING	DC-3	11	4						3	60						512	N/A	N/A
10690	ADP BUILDING	DC-3	11	6		107.20					6						50	N/A	N/A
10690	ADP BUILDING	HV-1	1	4						3	60						512	N/A	N/A
10690	ADP BUILDING	HV-1	1	1		4,566.70	168.40				992	1	1	1	1	604	8,658	14.3	0.6
10690	ADP BUILDING	HV-1	1	3			24.40				108		1		1	363	948	2.6	3.4
10690	ADP BUILDING	HV-2	1	3			78.60				347		1		1	363	3,054	8.4	1.0
10690	ADP BUILDING	HV-2	1	4						3	60						512	N/A	N/A
10690	ADP BUILDING	HV-2	1	1		8,103.00	538.70				2,819	1	1	1	1	604	24,684	40.9	0.2
10690	ADP BUILDING	HX-1	9	4						3	60						512	N/A	N/A
10690	ADP BUILDING	HX-1	9	7			4.40				19		1		2	773	171	0.2	39.8
10710	FIRE STATION	C-1	9	4						3	60						512	N/A	N/A
10710	FIRE STATION	C-1	9	7			1.70				7		1		2	773	66	0.1	103.1
10710	FIRE STATION	FTR	12	4						3	60						512	N/A	N/A
10710	FIRE STATION	FTR	12	3			2.40				11		1		1	472	93	0.2	44.6
10710	FIRE STATION	HV-1	1	3			21.60				95		1		1	363	839	2.3	3.8
10710	FIRE STATION	HV-1	1	4						3	60						512	N/A	N/A
10715	POST SAFETY/LEA	ACU-1	4	1	0.6						4	1		2	1	584	35	0.1	141.5
10715	POST SAFETY/LEA	ACU-1	4	3			4.20				19		2		1	534	163	0.3	28.8
10715	POST SAFETY/LEA	ACU-1	4	4						3	60						512	N/A	N/A
10715	POST SAFETY/LEA	HVU-1	1	4						3	60						512	N/A	N/A
10715	POST SAFETY/LEA	HVU-1	1	3			20.30				90		1		1	363	789	2.2	4.1
10715	POST SAFETY/LEA	HVU-2	1	4						3	60						512	N/A	N/A
10715	POST SAFETY/LEA	HVU-2	1	3			50.70				224		1		1	363	1,970	5.4	1.6
10715	POST SAFETY/LEA	HVU-3	1	1		57,364.40	315.60				4,530	1	1	1	1	604	38,839	64.3	0.1
10715	POST SAFETY/LEA	HVU-3	1	3			11.60				51		1		1	363	451	1.2	7.1
10715	POST SAFETY/LEA	HVU-3	1	4						3	60						512	N/A	N/A
10715	POST SAFETY/LEA	HX-1	12	3			2.60				11		1		1	472	101	0.2	41.2
10715	POST SAFETY/LEA	HX-1	12	7			7.10				31						276	N/A	N/A
10715	POST SAFETY/LEA	HX-1	12	4						3	60						512	N/A	N/A
10715	POST SAFETY/LEA	HX-1	12	1		16,683.90	46.70				1,119	1		1	2	576	9,544	16.6	0.5
10715	POST SAFETY/LEA	HX-2	9	7			6.20				27		1		2	773	241	0.3	28.3
10715	POST SAFETY/LEA	HX-2	9	1		162.00					9	1		1		289	75	0.3	32.6
10715	POST SAFETY/LEA	HX-2	9	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-1	3	1		101,645.30	198.00				6,433	1	1	1	1	604	54,786	90.7	0.1
10730	CLO SALES STORE & EXCH MAIN	AHU-1	3	2		1,911.20					105						885	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-1	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-1	3	3		18,640.00	20.80				1,111		2		1	534	9,444	17.7	0.5
10730	CLO SALES STORE & EXCH MAIN	AHU-10	3	3		1,734.00	1.60				102		2		1	534	866	1.6	5.2

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10730	CLO SALES STORE & EXCH MAIN	AHU-10	3	2		177.80					10						82	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-10	3	1		7,589.50	12.10			6	589	1	1	1	1	604	5,010	8.3	1.0
10730	CLO SALES STORE & EXCH MAIN	AHU-2	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-2	3	2		770.40					42						357	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-2	3	1		36,406.90	87.30				2,376	1	1	1	1	604	20,259	33.5	0.3
10730	CLO SALES STORE & EXCH MAIN	AHU-2	3	3		7,513.80	10.00				455		2		1	534	3,870	7.2	1.2
10730	CLO SALES STORE & EXCH MAIN	AHU-3	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-3	3	1		18,303.80	10.10				1,046	1	1	1	1	604	8,873	14.7	0.6
10730	CLO SALES STORE & EXCH MAIN	AHU-3	3	2		395.10					22						183	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-3	3	3		3,853.30	3.40				226		2		1	534	1,917	3.6	2.4
10730	CLO SALES STORE & EXCH MAIN	AHU-4	3	2		738.80					40						342	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-4	3	1		33,282.70	29.50				1,951	1	1	1	1	604	16,566	27.4	0.3
10730	CLO SALES STORE & EXCH MAIN	AHU-4	3	3		7,205.60	3.60				410		2		1	534	3,478	6.5	1.3
10730	CLO SALES STORE & EXCH MAIN	AHU-4	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-5	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-5	3	1		49,899.00	17.20				2,805	1	1	1	1	604	23,787	39.4	0.2
10730	CLO SALES STORE & EXCH MAIN	AHU-5	3	3		8,188.20	5.80				473		2		1	534	4,019	7.5	1.1
10730	CLO SALES STORE & EXCH MAIN	AHU-5	3	2		839.50					46						389	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-6	3	2		164.90					9						76	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-6	3	3		1,608.70	0.80				92		2		1	534	776	1.5	5.8
10730	CLO SALES STORE & EXCH MAIN	AHU-6	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-6	3	1		11,017.10	10.90				651	1	1	1	1	604	5,528	9.2	0.9
10730	CLO SALES STORE & EXCH MAIN	AHU-7	3	2		98.80					5						46	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-7	3	1		7,358.70	5.50				427	1	1	1	1	604	3,623	6.0	1.4
10730	CLO SALES STORE & EXCH MAIN	AHU-7	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-7	3	3		963.30	0.40				54		2		1	534	462	0.9	9.8
10730	CLO SALES STORE & EXCH MAIN	AHU-8	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-8	3	3		4,431.20	5.30				266		2		1	534	2,259	4.2	2.0
10730	CLO SALES STORE & EXCH MAIN	AHU-8	3	1		26,410.00	38.10				1,613	1	1	1	1	604	13,716	22.7	0.4
10730	CLO SALES STORE & EXCH MAIN	AHU-8	3	2		454.30					25						210	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-9	3	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-9	3	2		345.20					19						160	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	AHU-9	3	3		3,366.80	5.30				208		2		1	534	1,766	3.3	2.6
10730	CLO SALES STORE & EXCH MAIN	AHU-9	3	1		18,316.70	35.70				1,159	1	1	1	1	604	9,873	16.3	0.5
10730	CLO SALES STORE & EXCH MAIN	CH-1	11	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	CH-2	11	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	HE-1	12	1		19,993.90	886.00				5,001	1		1	2	576	43,686	75.8	0.1
10730	CLO SALES STORE & EXCH MAIN	HE-1	12	7			15.50				68						602	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	HE-1	12	4						3	60						512	N/A	N/A
10730	CLO SALES STORE & EXCH MAIN	HE-1	12	3			301.10				1,328		1		1	472	11,698	24.8	0.4
10732	CLASS VI	ACCU-1	11	4						3	60						512	N/A	N/A
10732	CLASS VI	ACCU-1	11	1	0.9	1,031.50					63	1		1		289	531	1.8	4.6
10732	CLASS VI	ACCU-2	11	1	0.9	1,031.50					63	1		1		289	531	1.8	4.6
10732	CLASS VI	ACCU-2	11	4						3	60						512	N/A	N/A
10732	CLASS VI	AHU-1	4	1		14,534.40			72.10		1,233	1		2	1	584	10,887	18.6	0.5
10732	CLASS VI	AHU-1	4	4						3	60						512	N/A	N/A
10732	CLASS VI	AHU-1	4	3		2,981.70			18.70		277		2		1	534	2,459	4.6	1.9
10732	CLASS VI	AHU-1	4	2		305.70					17		1		2	647	142	0.2	38.7
10745	CHILD SUPPORT CENTER	HV-1	1	3			143.70				634		1		1	363	5,583	15.4	0.6
10745	CHILD SUPPORT CENTER	HV-1	1	1		8,301.00	552.10				2,889	1	1	1	1	604	25,296	41.9	0.2
10745	CHILD SUPPORT CENTER	HV-1	1	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10745	CHILD SUPPORT CENTER	HV-2	1	4						3	60						512	N/A	N/A
10745	CHILD SUPPORT CENTER	HV-2	1	1		6,850.00	386.50				2,079	1	1	1	1	604	18,190	30.1	0.3
10745	CHILD SUPPORT CENTER	HV-2	1	3			100.60				444		1		1	363	3,909	10.8	0.8
10745	CHILD SUPPORT CENTER	HV-3	1	1		6,850.00	379.60				2,049	1	1	1	1	604	17,922	29.7	0.3
10745	CHILD SUPPORT CENTER	HV-3	1	4						3	60						512	N/A	N/A
10745	CHILD SUPPORT CENTER	HV-3	1	3			98.80				436		1		1	363	3,839	10.6	0.8
10745	CHILD SUPPORT CENTER	HV-4	1	4						3	60						512	N/A	N/A
10745	CHILD SUPPORT CENTER	HV-4	1	3			98.80				436		1		1	363	3,839	10.6	0.8
10745	CHILD SUPPORT CENTER	HV-4	1	1		6,850.00	379.60				2,049	1	1	1	1	604	17,922	29.7	0.3
10745	CHILD SUPPORT CENTER	HX-1	12	4						3	60						512	N/A	N/A
10745	CHILD SUPPORT CENTER	HX-1	12	1		4,300.80	598.10				2,873	1		1	2	576	25,230	43.8	0.2
10745	CHILD SUPPORT CENTER	HX-1	12	7			15.90				70						618	N/A	N/A
10745	CHILD SUPPORT CENTER	HX-1	12	3			155.70				687		1		1	472	6,049	12.8	0.7
10785	CHILD CARE CNTR	AHU-1	2	3			12.30				54		1		1	363	478	1.3	6.7
10785	CHILD CARE CNTR	AHU-1	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-1	2	1		102,708.80	459.80				7,646	1	1	2	1	756	65,450	86.6	0.1
10785	CHILD CARE CNTR	AHU-10	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-10	2	3			28.60				126		1		1	363	1,111	3.1	2.9
10785	CHILD CARE CNTR	AHU-10	2	1		15,000.70	16.40				893	1	1	2	1	756	7,587	10.0	0.8
10785	CHILD CARE CNTR	AHU-2	2	1		65,417.80	178.60				4,366	1	1	2	1	756	37,248	49.3	0.2
10785	CHILD CARE CNTR	AHU-2	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-2	2	3			64.80				286		1		1	363	2,518	6.9	1.3
10785	CHILD CARE CNTR	AHU-3	2	1		25,947.30	15.80				1,489	1	1	2	1	756	12,635	16.7	0.5
10785	CHILD CARE CNTR	AHU-3	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-3	2	3			27.50				121		1		1	363	1,068	2.9	3.0
10785	CHILD CARE CNTR	AHU-4	2	3			55.60				245		1		1	363	2,160	6.0	1.5
10785	CHILD CARE CNTR	AHU-4	2	1		52,116.70	31.90				2,991	1	1	2	1	756	25,386	33.6	0.3
10785	CHILD CARE CNTR	AHU-4	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-5	2	1		36,831.60	25.60				2,128	1	1	2	1	756	18,059	23.9	0.4
10785	CHILD CARE CNTR	AHU-5	2	3			44.70				197		1		1	363	1,737	4.8	1.8
10785	CHILD CARE CNTR	AHU-5	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-6	2	3			77.40				341		1		1	363	3,007	8.3	1.1
10785	CHILD CARE CNTR	AHU-6	2	1		63,695.10	44.40				3,680	1	1	2	1	756	31,236	41.3	0.2
10785	CHILD CARE CNTR	AHU-6	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-7	2	3			31.40				138		1		1	363	1,220	3.4	2.6
10785	CHILD CARE CNTR	AHU-7	2	1		24,398.20	18.00				1,414	1	1	2	1	756	12,003	15.9	0.5
10785	CHILD CARE CNTR	AHU-7	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-8	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	AHU-8	2	1		36,831.60	26.00				2,129	1	1	2	1	756	18,075	23.9	0.4
10785	CHILD CARE CNTR	AHU-8	2	3			45.30				200		1		1	363	1,760	4.8	1.8
10785	CHILD CARE CNTR	AHU-9	2	3			55.60				245		1		1	363	2,160	6.0	1.5
10785	CHILD CARE CNTR	AHU-9	2	1		42,908.80	31.90				2,488	1	1	2	1	756	21,119	27.9	0.3
10785	CHILD CARE CNTR	AHU-9	2	4						3	60						512	N/A	N/A
10785	CHILD CARE CNTR	HE-1	12	3			103.90				458		1		1	472	4,037	8.6	1.0
10785	CHILD CARE CNTR	HE-1	12	7			14.80				65						575	N/A	N/A
10785	CHILD CARE CNTR	HE-1	12	1		2,140.20	59.50				379	1		1	2	576	3,303	5.7	1.5
10785	CHILD CARE CNTR	HE-1	12	4						3	60						512	N/A	N/A
10790	YOUTH CENTER	HV-1	1	4						3	60						512	N/A	N/A
10790	YOUTH CENTER	HV-1	1	1		8,103.00	552.10				2,878	1	1	1	1	604	25,204	41.7	0.2
10790	YOUTH CENTER	HV-1	1	3			143.70				634		1		1	363	5,583	15.4	0.6
10790	YOUTH CENTER	HV-2	1	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10790	YOUTH CENTER	HV-2	1	3			100.60				444		1		1	363	3,909	10.8	0.8
10790	YOUTH CENTER	HV-2	1	1		6,850.00	386.50				2,079	1	1	1	1	604	18,190	30.1	0.3
10790	YOUTH CENTER	HV-3	1	4						3	60						512	N/A	N/A
10790	YOUTH CENTER	HV-3	1	1		6,850.00	379.60				2,049	1	1	1	1	604	17,922	29.7	0.3
10790	YOUTH CENTER	HV-3	1	3			98.80				436		1		1	363	3,839	10.6	0.8
10790	YOUTH CENTER	HV-4	1	3			98.80				436		1		1	363	3,839	10.6	0.8
10790	YOUTH CENTER	HV-4	1	1		6,850.00	379.60				2,049	1	1	1	1	604	17,922	29.7	0.3
10790	YOUTH CENTER	HV-4	1	4						3	60						512	N/A	N/A
10790	YOUTH CENTER	HX-1	12	3			144.50				637		1		1	472	5,614	11.9	0.7
10790	YOUTH CENTER	HX-1	12	4						3	60						512	N/A	N/A
10790	YOUTH CENTER	HX-1	12	7			15.90				70						618	N/A	N/A
10790	YOUTH CENTER	HX-1	12	1		4,300.80	555.40				2,685	1		1	2	576	23,571	40.9	0.2
11050	CLINIC W/O BEDS	ACCU1A	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU1A	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU1B	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU1B	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU1C	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU1C	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU2A	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU2A	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU2B	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU2B	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU2C	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU2C	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU3A	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU3A	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU3B	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU3B	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	AHU-1	7	3		959.80		30.60			183		3		2	1,007	1,694	1.7	5.5
11050	CLINIC W/O BEDS	AHU-1	7	4						6	120						1,024	N/A	N/A
11050	CLINIC W/O BEDS	AHU-1	7	1		69,089.90		516.70			5,977	2		2	2	843	53,111	63.0	0.1
11050	CLINIC W/O BEDS	AHU-2	7	3		18,743.00		183.80			1,807		3		2	1,007	16,190	16.1	0.6
11050	CLINIC W/O BEDS	AHU-2	7	4						6	120						1,024	N/A	N/A
11050	CLINIC W/O BEDS	AHU-3	4	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	AHU-3	4	3		12,338.90		176.80			1,427		2		1	534	12,937	24.2	0.4
11050	CLINIC W/O BEDS	AHU-4	7	4						6	120						1,024	N/A	N/A
11050	CLINIC W/O BEDS	AHU-4	7	3		23,532.00		135.20			1,862		3		2	1,007	16,424	16.3	0.5
11050	CLINIC W/O BEDS	AHU-5	7	4						6	120						1,024	N/A	N/A
11050	CLINIC W/O BEDS	AHU-5	7	1	7.3	27,032.20		203.10			2,393	2		2	2	843	21,247	25.2	0.4
11050	CLINIC W/O BEDS	AHU-5	7	3		939.40		14.90			115		3		2	1,007	1,044	1.0	8.8
11050	CLINIC W/O BEDS	AHU-6	7	1		29,948.00		431.30			3,473	2		2	2	843	31,489	37.4	0.2
11050	CLINIC W/O BEDS	AHU-6	7	3		1,296.60		44.30			259		3		2	1,007	2,410	2.4	3.9
11050	CLINIC W/O BEDS	AHU-6	7	4						6	120						1,024	N/A	N/A
11050	CLINIC W/O BEDS	B-1	10	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	B-1	10	7				6.70			29				2	602	274	0.5	21.1
11050	CLINIC W/O BEDS	B-2	13	4						3	60				1	388	512	1.3	6.5
11050	CLINIC W/O BEDS	CHR-1A	8	6		173.50					9						80	N/A	N/A
11050	CLINIC W/O BEDS	CHR-1A	8	1	1.03						7	2		2		578	60	0.1	81.6
11050	CLINIC W/O BEDS	CHR-1A	8	4						3	60				2	602	512	0.9	10.0
11050	CLINIC W/O BEDS	CHR-1B	8	6		173.50					9						80	N/A	N/A
11050	CLINIC W/O BEDS	CHR-1B	8	4						3	60				2	602	512	0.9	10.0

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
10790	YOUTH CENTER	HX-1	12	1		4,300.80	555.40				2,685	1		1	2	576	23,571	40.9	0.2
10790	YOUTH CENTER	HV-4	1	3			98.80				436		1		1	363	3,839	10.6	0.8
10790	YOUTH CENTER	HV-4	1	1		6,850.00	379.60				2,049	1	1	1	1	604	17,922	29.7	0.3
10790	YOUTH CENTER	HV-3	1	3			98.80				436		1		1	363	3,839	10.6	0.8
10790	YOUTH CENTER	HV-3	1	1		6,850.00	379.60				2,049	1	1	1	1	604	17,922	29.7	0.3
10790	YOUTH CENTER	HV-1	1	1		8,103.00	552.10				2,878	1	1	1	1	604	25,204	41.7	0.2
10790	YOUTH CENTER	HV-1	1	3			143.70				634		1		1	363	5,583	15.4	0.6
10790	YOUTH CENTER	HV-3	1	4						3	60						512	N/A	N/A
10790	YOUTH CENTER	HV-1	1	4						3	60						512	N/A	N/A
10790	YOUTH CENTER	HV-2	1	3			100.60				444		1		1	363	3,909	10.8	0.8
10790	YOUTH CENTER	HV-2	1	1		6,850.00	386.50				2,079	1	1	1	1	604	18,190	30.1	0.3
10790	YOUTH CENTER	HV-2	1	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	CHR-1A	8	6		173.50					9						80	N/A	N/A
11050	CLINIC W/O BEDS	CHR-1B	8	4						3	60				2	602	512	0.9	10.0
11050	CLINIC W/O BEDS	CHR-1B	8	1	1.03						7	2		2		578	60	0.1	81.6
11050	CLINIC W/O BEDS	B-1	10	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	CHR-1A	8	4						3	60				2	602	512	0.9	10.0
11050	CLINIC W/O BEDS	CHR-1A	8	1	1.03						7	2		2		578	60	0.1	81.6
11050	CLINIC W/O BEDS	B-1	10	7				6.70			29				2	602	274	0.5	21.1
11050	CLINIC W/O BEDS	CHR-1C	8	1	1.03						7	2		2		578	60	0.1	81.6
11050	CLINIC W/O BEDS	AHU-6	7	3		1,296.60		44.30			259		3		2	1,007	2,410	2.4	3.9
11050	CLINIC W/O BEDS	AHU-6	7	1		29,948.00		431.30			3,473	2		2	2	843	31,489	37.4	0.2
11050	CLINIC W/O BEDS	CHR-1C	8	6		173.50					9						80	N/A	N/A
11050	CLINIC W/O BEDS	HV-2	1	3			36.70				162		1		1	363	1,426	3.9	2.2
11050	CLINIC W/O BEDS	CHR-1C	8	4						3	60				2	602	512	0.9	10.0
11050	CLINIC W/O BEDS	HV-1	1	1		16,000.80	195.30				1,737	1	1	1	1	604	15,001	24.8	0.3
11050	CLINIC W/O BEDS	HX-1	9	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	HX-1A	12	7			3.30				15						128	N/A	N/A
11050	CLINIC W/O BEDS	HX-1A	12	1		2,287.70	619.00				2,855	1		1	2	576	25,109	43.6	0.2
11050	CLINIC W/O BEDS	HX-1A	12	3			63.60				280		1		1	472	2,471	5.2	1.7
11050	CLINIC W/O BEDS	HX-1A	12	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	HX-1	9	7			16.00				71		1		2	773	622	0.8	11.0
11050	CLINIC W/O BEDS	HV-1	1	3			20.10				89		1		1	363	781	2.2	4.1
11050	CLINIC W/O BEDS	HV-2	1	1		28,521.20	490.90				3,725	1	1	1	1	604	32,287	53.5	0.2
11050	CLINIC W/O BEDS	HV-2	1	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	AHU-5	7	1	7.3	27,032.20		203.10			2,393	2		2	2	843	21,247	25.2	0.4
11050	CLINIC W/O BEDS	HV-1	1	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	AHU-6	7	4						6	120						1,024	N/A	N/A
11050	CLINIC W/O BEDS	CHR-1B	8	6		173.50					9						80	N/A	N/A
11050	CLINIC W/O BEDS	AHU-5	7	4						6	120						1,024	N/A	N/A
11050	CLINIC W/O BEDS	ACCU1C	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU2B	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU2B	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU2A	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU1C	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU1B	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU1B	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU2C	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	ACCU1A	11	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	ACCU1A	11	1	0.75						5	1		1		289	44	0.2	56.0
11050	CLINIC W/O BEDS	B-1	13	4						3	60						512	N/A	N/A

TABLE E-2
SYSTEM SUMMARY LISTED BY BUILDING

BLDG NO.	BLDG DESCRIPTION	SYSTEM NAME	SYSTEM NUMBER	EMCS FUNC.	kW SAVING PER YR	kWh SAVING PER YR	MBtu District Htg SAVING PER YR	MBtu F. OIL #2 SAVING PER YR	MBtu LPG SAVING PER YR	LABOR HOURS SAVING PER YR	$ COST SAVING PER YR	DO POINT	AO POINT	DI POINT	AI POINT	TOTAL BLDG. INST. COST	TOTAL $ DISC. SAVING	SIR	SIMPLE PAYBACK
11050	CLINIC W/O BEDS	CHR-1B	8	1	1.03						7	2		2		578	60	0.1	81.6
11050	CLINIC W/O BEDS	CHR-1C	8	4						3	60				2	602	512	0.9	10.0
11050	CLINIC W/O BEDS	CHR-1C	8	6		173.50					9						80	N/A	N/A
11050	CLINIC W/O BEDS	CHR-1C	8	1	1.03						7	2		2		578	60	0.1	81.6
11050	CLINIC W/O BEDS	HV-1	1	3			20.10				89		1		1	363	781	2.2	4.1
11050	CLINIC W/O BEDS	HV-1	1	1		16,000.80	195.30				1,737	1	1	1	1	604	15,001	25	0.35
11050	CLINIC W/O BEDS	HV-1	1	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	HV-2	1	1		28,521.20	490.90				3,725	1	1	1	1	604	32,287	53	0.16
11050	CLINIC W/O BEDS	HV-2	1	3			36.70				162		1		1	363	1,426	4	2.24
11050	CLINIC W/O BEDS	HV-2	1	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	HX-1	9	4						3	60						512	N/A	N/A
11050	CLINIC W/O BEDS	HX-1	9	7			16.00				71		1		2	773	622	1	10.96
11050	CLINIC W/O BEDS	HX-1A	12	3			63.60				280		1		1	472	2,471	5	1.68
11050	CLINIC W/O BEDS	HX-1A	12	7			3.30				15						128	N/A	N/A
11050	CLINIC W/O BEDS	HX-1A	12	1		2,287.70	619.00				2,855	1		1	2	576	25,109	44	0.20
11050	CLINIC W/O BEDS	HX-1A	12	4						3	60						512	N/A	N/A
11130	ELEC SUBSTATION	ELEC												1		100			N/A
11142	EMTOMOLOGY FAC	B-1	10	4						3	60						512	N/A	N/A
11142	EMTOMOLOGY FAC	B-1	10	7			3				15				2	602	132	0	40.15
11144	REFUSE COLL BLDG	B-1	10	7			3				15				2	602	132	0	40.15
11144	REFUSE COLL BLDG	B-1	10	4						3	60						512	N/A	N/A
21510	MAIN WASH	B-1	10	4						3	60						512	N/A	N/A
21510	MAIN WASH	B-1	10	7					49.50		300				2	602	2,851	5	2.00
21510	MAIN WASH	B-2	10	4						3	60						512	N/A	N/A
21510	MAIN WASH	B-2	10	7					49.50		300				2	602	2,851	5	2.00
21510	MAIN WASH	HX-1	9	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-1	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-1	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-10	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-10	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-2	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-2	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-3	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-3	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-4	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-4	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-5	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-5	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-6	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-6	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-7	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-7	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-8	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-8	1	4						3	60						512	N/A	N/A
21510	MAIN WASH	MAU-9	1	3					3.50		21		1		1	363	202	1	17.09
21510	MAIN WASH	MAU-9	1	4						3	60						512	N/A	N/A

APPENDIX F

COST ESTIMATES

(To be used in a future submittal)